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THE MAINTENANCE OF BEEF BREEDING COWS

BY

EARLIE EDGAR ELLIOTT

THESIS

FOR THE

DEGREE OF BACHELOR OF SCIENCE

IN

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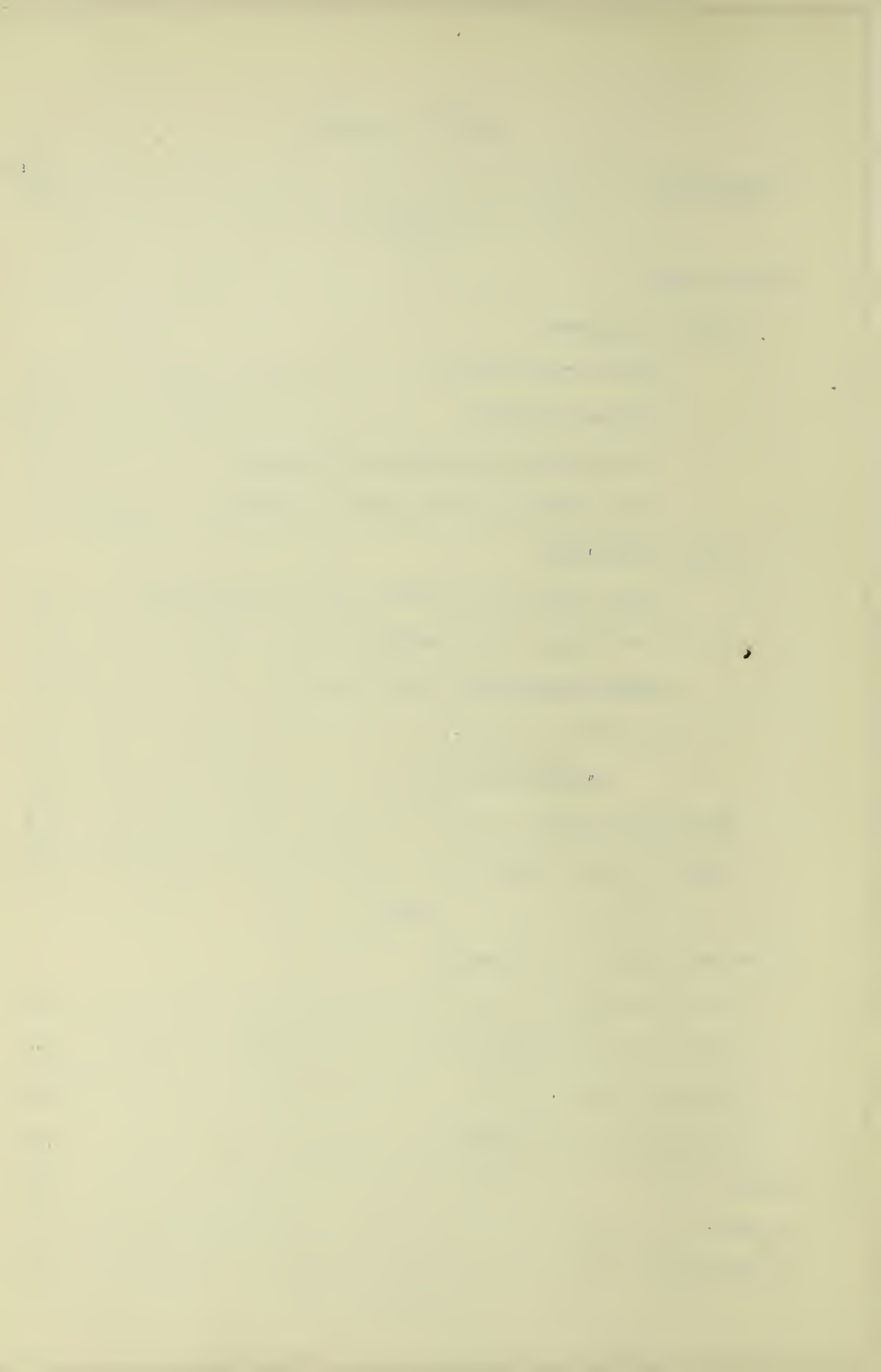
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## THE MAINTENANCE OF BEEF BREEDING COWS

### INTRODUCTION

The question of economic beef production has of late years become a very interesting and vital one. While the beef cattle industry has always held one of the most important places among agricultural activities, yet the highest development of any one phase of the industry has not been fully realized. The subject of maintaining beef breeding cows has formerly been given little attention by most people, even the practical stockman. During the early development of the beef cattle industry in the United States, the cattlemen were not confronted with the same economic structure they are facing at the present time. When, in the early days, the numerous herds of beef cattle invaded what is now the corn-belt states which had a sparse population, they had a better opportunity to make the early settler money than had the later herds.

During the early history of the corn belt, before it was densely populated and before grain farming developed, the cow had free access to unlimited acres of pasture that could be used for no other purpose. There came a time, however, when the cow could no longer be given a place in the economic role of the corn-belt farmer. As the population increased in the rural districts, it increased even more rapidly in the cities, which demanded more intensive methods of cultivating the vast areas that formerly belonged to the cattle range. Consequently, large pasture areas were plowed and devoted to a more diversified and intensified system of grain farming as opposed to the old extensive methods that prevailed when the supply of grass was unlimited. Thus it was that the herds of beef cattle were necessarily



dispersed or moved farther westward. As the present highly-specialized system of grain farming was being developed throughout the corn belt, an extensive system of cattle-ranching was developed throughout the western states. For a number of years these two systems of agriculture went hand in hand in the economic production of beef. The western cattlemen could economically produce feeders of an enviable type that the corn-belt farmer demanded, through which he could make his surplus grain at a profit.

It soon became evident, however, that the western ranges were to undergo a transformation of agricultural activities as the corn belt had done in previous years. As the corn belt became so densely inhabited, the population naturally spread into the western range lands. As the settlers moved in and occupied little by little of the range area, it was evident that the cow would soon be crowded to her last acre of range, and hence the practical elimination of the range industry.

The corn-belt farmer was then brought face to face with the facts of an important and declining phase of agriculture. The question, then, of where the future supply of feeding cattle would come from was a pertinent one and it was obvious that each farmer must practice the most rigid economy in disposing of his surplus feed and roughages if breeding herds were to be maintained. The breeding of cattle on high-priced lands presupposes the economic maintenance of beef breeding cows from which the future supply of beef must be bred.

The fluctuation of prices, the decrease in number of cattle, and increase of population during the last few decades are shown graphically in Plates I and II.

In the light of the foregoing facts, a number of the state experiment stations have been carrying on a number of investigations to obtain





information regarding economical methods of maintaining beef breeding cows. The data obtained, thusfar, , while not conclusive in every way, do throw some light on the subject, and open up brighter prospects for the beef cattle industry, even on high-priced lands in highly-specialized grain farming sections. In collecting and working up the data used in the following pages, the results have been considered, as they were obtained on experimental farms and were probably more accurate than those which might be secured from the average farm. Whatever that difference may be, there is no doubt but what the principles involved are applicable to a wider range of conditions. Most of the data presented herein have been selected after a careful study of the available records and reports of the various stations. In most cases, nothing more than tables showing the results are available, however, and only meager conclusions can be drawn from them, in as much as the object of the tests carried on and results obtained are applicable more or less to local conditions. While an effort has been made to treat with justice the data obtained from various experiment stations, yet the magnitude and comprehensiveness of the data thus far obtainable from the investigations now in progress at the Illinois station have been used as a basis of this thesis.

The primary object of this thesis is to deal with beef breeding cows from the market class standpoint. I feel, however, that a paper on this subject would not be complete without some reference to the maintenance of pure-bred cattle and show herds, and in as much as the subject at hand pertains to beef breeding cows, an effort has been made to collect from the leading and most successful breeders and showmen of beef cattle some information as to their methods of managing, breeding, feeding, pasturing, and housing their cattle. A limited space is therefore given to a presentation of brief statements which have been collected from various sources and prepared for this purpose.



POPULATION, NUMBER OF CATTLE, ACRES IMPROVED LAND,  
AND ACREAGE OF CEREAL IN CORNBELT SINCE 1870.

PLATE I	1870	1880	1890	1900	1910
Total population	10,283,495	13,495,727	16,773,331	19,370,270	21,507,857
Rural population*	(**)	10,179,195	11,142,158	11,609,336	11,338,437
A. improved land	65,048,480	110,985,823	141,637,584	159,894,729	172,566,573
Acres of cereal	(**)	57,750,163	69,139,324	86,198,162	86,414,295
No. all cattle	7,613,700	10,744,104	17,262,112	20,578,065	13,322,000
Cattle other than milch cows	44,720,800	7,044,705	11,502,376	14,866,841	12,094,000

\* Census figures not available for 1870.

\*\*\* Estimate of department of agriculture.

PERCENT OF INCREASE OR DECREASE IN POPULATION, CROP ACREAGE, IMPROVED  
LAND AND CATTLE IN THE CORNBELT SINCE 1870\*

	1870-80	1880-90	1890-1900	1900-10
Total population	31.1%	24.2%	15.4%	11%
Improved land	(*)	99.1	4.1%	-2.3%
Acreage of cereal crops	(*)	19.7%	24.6%	.2%
Number of all cattle	41.1%	60.4%	19.2%	-10.2%
Cattle other than milch cows	63.2%	29.2%	29.2%	-18.2%

\* Calculated.

(\*) Census figures not obtainable for 1870-80.





PLATE II.  
Relative number.

1890 '92 '94 '96 '98 1900 '02 '04 '06 '08 '10 '12 '14 '16 '18



Chicago price of cattle, good to choice.

Estimate of the Department of Agriculture, for the number of cattle in the cornbelt.

Combined receipts of cattle at Chicago, St. Louis, Kansas City, and Omaha.



# THE MAINTENANCE OF BEEF BREEDING COWS

## PART I

### MARKET CATTLE

#### SUMMER MAINTENANCE

##### PASTURE REQUIREMENTS FOR COWS:

In pasturing beef breeding cows there are two distinct systems in practice, viz., permanent pasture and rotated pasture. A permanent pasture seems to have some decided advantages over a pasture used in rotation with other crops. A permanent pasture simplifies the matter of fencing, water supply, sheds, and does away with the labor and expense of reseeding. If a permanent pasture is properly supplemented during hard seasons, it is never a complete failure. These advantages are probably largely responsible for the use of blue grass as a permanent pasture. Of the cattlemen of Illinois, for example, 55 per cent use blue grass, 25 per cent timothy, 15 per cent clover, and the remainder use about equal areas of red-top, rye, cow-pea and orchard grass.

The rotated pasture system has its advantages, however. This system gives much better opportunity to distribute evenly on all parts of the farm the manure produced by the cattle. The choice between a permanent and a rotated pasture will depend on the location of the farm and the adaptability of various portions of it for different crops.

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1. Mumford, Herbert W. Beef Production, pp.105-109.





On land adapted to permanent pasture, probably the best pasture for cattle grazing is the blue grass. Timothy is not a particularly valuable pasture, while clover, alfalfa, and blue grass are admirably adapted to cattle grazing, were it not for the tendency of the clover to cause bloat. During the past three summers, the beef cattle division of the University of Illinois has satisfactorily maintained cows on the above-named legumes without any trouble from bloating. It is the practice of this station to take cattle from winter quarters and allow them to get a fill of blue grass before turning on the clover. The number of acres per cow or the pasture days per cow on a given area of pasture depends on the kind of pasture, stand, time cattle were turned on the pasture, and the season.

In the fall of 1912, the Illinois Station started a series of investigations concerning the maintenance of beef breeding cows. Probably one of the most significant features of this series of investigations is the comparison of permanent pastures with various kinds of rotated pasture composed chiefly of legumes. While it is a well-known fact that cattle are preëminently the most important consumers of forage crops among our domestic animals, yet there is practically no available data on the value of forage crops for cattle.<sup>1</sup>

#### PERMANENT VS ROTATED PASTURES.

During the summer of 1913, red clover pasture gave approximately as much pasture per acre as good blue grass pasture. Six two-year-old cows and one calf were placed in a field of 8.15 acres of red clover, and a similar lot of cattle were placed on 7.68 acres of blue grass. It became necessary to supplement both lots during the driest part of the summer. The total amounts of supplements used were 4211 pounds and 5277 pounds of alfalfa in clover and blue grass pastures respectively. If we figure alfalfa on the basis of

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1. Rusk, H. P. Production of Beef Calves.



4 tons per acre, the total area required to maintain a cow through the summer season of 168 days was 1.446 acres in the clover lot and 1.39 acres in the blue grass lot.

During the summer of 1914, three lots of ten head of cows were pastured on blue grass, with the results shown in Table II. In calculating the daily cost and season cost, the supplementary feeds have been considered. In calculating the days pasture per acre, only the pasture was considered.

During the summer of 1915, three lots of 10 head of cows were maintained on blue grass pasture, with the results shown in Table III.

In the summer of 1916, one test was made with spring-sown sweet clover. 8.05 acres of corn stubble land were seeded to sweet clover in April, and nine two-year-old pure bred heifers were turned in July 1 of the same season. Two heifers were removed after 105 days and the remaining seven at the end of 119 days, giving in all 128 pasture days per acre. The average gain in weight was 75.5 pounds, which was satisfactory considering the high condition of the heifers when turned into the field. During the same season, 1.5 acres of mixed blue grass, timothy, and clover pasture failed completely to carry a cow and calf after four and one-half months, giving only 98 pasture days per acre with the aid of supplementary feeds. These results are shown in Table IV. See also Plate III.

During the same season, a second-year's stand of sweet clover failed to carry a cow and calf per acre. This failure was probably due to the way in which the clover was treated. The clover was allowed to get too rank a growth before the cattle were turned in and one-half the field was mowed for hay, which completely killed out a large proportion of it. (See Table IV, Lot I).

CORN SILAGE AS A SUPPLEMENT TO PASTURE.

A combination of silage with pasture seems to be more economical and practical than pasture alone. For the past five years, the Illinois Station





has obtained some data on various methods of supplementing pasture with other feeds, and silage has played the most important part in the investigation. During the past three summers, the Illinois Station has maintained one lot of cows on a pasture allowance of one-half acre per head (see Lot II, Plate V), another on an allowance of one acre per head (see Lot III, Plate IV), and a third lot on a pasture allowance of 1.5 acres per head (see Lot IV, Plate V). The first two lots have always been supplemented with cottonseed meal and silage in the ratio of 1:40. It was necessary to supplement the third lot two years out of three. The data thus far obtained are shown in Tables III, IV, V, and indicate that the economy of utilizing a small acreage of pasture and depending on corn silage and cottonseed meal as supplementary feeds, depends upon the season as well as upon the market price of corn in the silage. One significant feature has been constant, viz., that from the standpoint of economy of land involved, it always pays to supplement the pasture.<sup>1</sup> Obviously, the most stable comparison that can be made between full pasture and pasture supplemented is by using the land economy as the basis. This method of comparison presents some difficulties, since the silage and pasture are now the product of the same season and the price of labor varies with different seasons and conditions.

CORN SILAGE AS A SUBSTITUTE FOR PASTURE.

In an effort to obtain some information as to what is the most stable comparison between full pasture and the economy of the land involved, the Illinois Station maintained one lot of cows in dry lot through the summer season. This lot of cows received cottonseed meal and silage in a ratio of 1:40 and were successfully maintained on 40 pounds of silage and 1 pound of cottonseed meal per head per day. The economy of dry lot maintenance against full pasture maintenance obviously depends on the yield per acre of the crop fed. The

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1. H. P. Rusk      Production of Beef Calves.



average yield of silage from twelve fields used in the experimental silos during a period of eight years on the Animal Husbandry farm at the Illinois Station, was 11.78 tons per acre. The silage used in the experiment during the summer of 1913 was made from a field that produced 12.81 tons per acre. If we figure, then, on a basis of 12 tons per acre and not consider the cottonseed meal, the total area required to maintain a yearling heifer through a 168-day summer period was .208 acres, while the pasture lot required 1.2 acres (about six times as much) of pasture and alfalfa meadow to maintain one yearling heifer through the same period. The comparison of acres in dry lot and on pasture is shown in Table I. In figuring the pasture days per acre for Table I, the area added to represent the alfalfa was based on a yield of 4 tons per acre.

Since this series of experiments has been in progress, there have been only two seasons when 1.5 acres of blue grass pasture without supplementary feeds would carry a cow suckling a calf through the grazing season. On the other hand, it will be seen from the tables that silage-fed lots of cows have never received over 40 pounds per head per day, and sometimes less, and cottonseed meal. If we figure on a ration of 40 pounds of silage per cow per day from land yielding 12 tons per acre, the area required to maintain a cow through a 147-day period would be .245 acres. Table XII shows average daily ration and results obtained in Lot IV, which received silage as a substitute for pasture throughout four summer tests.

#### WINTER MAINTENANCE

##### CORN SILAGE AS THE BASIS OF WINTER MAINTENANCE.

During the fall of 1912, the Illinois Station purchased 48 head of grade Angus and Hereford cows to be used in the maintenance experiment. They were divided into four lots of twelve each. Some months later, the lots were reduced to ten head each and the personnel remained practically the same until the close of the summer trial of 1916.





The results of the winter maintenance in this experiment are shown in Tables VI to XI inclusive. The results of the first season point conclusively toward the economy of silage in the wintering of beef breeding cows. A study of Table VI shows that the silage-fed cows in Lots II and IV were maintained at a daily cost per head of 7.1 ¢ and 5.5. ¢ respectively, and that the former lot contained two calves, while the latter lot had no calves. The lot of cows on a ration of alfalfa, stover, shelled corn, and cottonseed meal did not make as good gains as the lot on silage and cottonseed meal, and cost almost three times as much per head per day for maintenance. This was the first winter these cattle were in the test and some of them were comparatively small, weighing approximately 475 pounds per head, which facts probably explain the reason for so comparatively small a cost of maintenance. During the winter of 1913-14, these same lots, with the same equipment of sheds and winter protection but with different rations in which silage was the chief constituent except in Lot I, were maintained as shown in Table VII. A study of the table reveals again the economy of silage in the winter ration for breeding cows. A ration of broken ear corn, alfalfa, and stover failed to maintain Lot I over a period of 196 days, each individual cow losing 155 pounds, while the daily cost of keeping them was 9.59 higher than the cost of any other lot, while the cattle in Lot IV were fed a daily ration of 30 pounds of silage and .75 pound cottonseed meal and gained 132 pounds per head, and cost daily only 5.83¢.

In Lot III oat straw was substituted in place of 10 pounds of silage and the cottonseed meal reduced to .5 pound per head per day. It will be seen by referring to the table that this lot was not only maintained but gained 37 pounds per head for the 196 days, and the maintenance cost per head per day was the cheapest of any lot. This fact alone suggests the efficient use of one of the most common and abundant crops, - oat straw, in the maintenance ration of the breeding herds. There were six calves in Lot I



and 5 calves in Lot II, all of which came strong and healthy.

The results of the winter tests of 1914-15 show, in Table VIII, as the previous winter test, that broken ear corn and straw and alfalfa do not maintain cows without their losing weight, and the cows in this lot cost more for daily maintenance. Lot II was maintained on a ration of silage, oat straw, and cottonseed meal at an average daily cost of 7.9¢ as compared with Lot II, which was maintained on cottonseed meal and silage alone at a daily cost of 8.2¢. This shown again that oat straw of good quality has a place for economy in the winter maintenance ration of beef cows. With the exception of the ration fed Lot II, the ration fed Lot IV was the cheapest from the standpoint of economy, and from the standpoint of economy of land involved, it was, in the long run, cheaper than the ration in Lot II.

All of the calves dropped in this winter test were strong and healthy, the average birth weight of the cow calves was 68.71 pounds, and that of the bull calves 76.22 pounds, or an average for the total of 71.65 pounds. At the end of three winters of this series of experiments, none of the cows showed any lack of thrift and were maintained in good average breeding condition throughout the entire period.

The results of the winter of 1915-16 are shown in Table IX. The striking feature here again is the economic use of oat straw in combination with silage and cottonseed meal. The cows in Lot I lost 222.5 pounds in weight and were maintained at a cost of 7.5¢ per head per day, or \$14.50 for the winter of 196 days. This loss in weight is probably due very largely to the fact that there was a 100 per cent calf crop, all of which were strong and healthy, which, of course, would naturally pull down the weights of the cows. The average birth weight of the calves in this lot was 75 pounds.

Lot II was maintained on a ration of the same feeds as Lot I, but in different proportion of straw and silage. In this lot the average loss





in weight was 188.5 pounds, daily cost 8.5¢, a 90 per cent calf crop with an average birth weight of 70 pounds.

Lot III was maintained on the same feeds, but in this lot the silage was increased to 30 pounds. It will be seen from the table that the cows lost 196.5 pounds for the 196 days and were maintained at a cost of 9.5¢ or 1 ¢ per head per day more than Lot II. This lot had a 100 per cent calf crop with an average birth weight of 71.5 pounds.

Lot II was maintained at practically a constant weight, gaining only 1 pound for the entire lot for the entire period. The daily cost was 10.6¢, with a 100 per cent calf crop, with an average birth weight of 76.5 pounds. This table shows that with the increase in amount of silage fed to the different lots, and with a gradual decrease of other feeds to 100 per cent silage ration, there was a gradual decrease in loss of weight or a gradual gain from -222.5 pounds in Lot I up to a +1 pound gain in Lot IV for the entire period. Similarly, the table shows that with the gradual increase in oat straw, there was a gradual decrease in the daily cost from 10.6¢ to 7.5¢. Considering the fact that there was a 100 per cent calf crop, all strong and healthy, and that the cows suckled their calves well and maintained a practically constant weight throughout the period, cottonseed meal and corn silage in a ratio of 1:40 is the most satisfactory ration.

Lot IVa was fed a daily ration of 5 pounds of alfalfa and 15.76 pounds straw, cost 6.7¢ per head daily, lost 136 pounds per head in weight and gave a calf crop of only 70 per cent.

During the winter of 1916-17, four lots of cows were maintained on rations, with the results shown in Table X.

Lots I and II received the same kind of feeds, but the oat straw fed to Lot II was cut and mixed with the silage, the theory here being to disguise the straw and induce the cows to consume more of it. However, the oat straw disguised the silage and the cows did not consume enough more of the straw



to justify cutting it. The cows in these two lots lost in weight but the cows that received uncut oat straw lost an average of 26 pounds more than those that received the oat straw.

During the first 39 days of the test, Lot III received green stover silage ad libitum. They consumed an average of 68.21 pounds of stover and 1 pound of cottonseed meal. The substitution of alfalfa hay in Lot III in the place of cottonseed meal, and the addition of alfalfa hay with a reduction of silage and oat straw decreased the efficiency of the ration and increased the cost.

#### CORN SILAGE VS OTHER WINTER FEEDS.

A study of the tables tabulated from the series of investigations reveal some interesting facts. Corn silage has been used continually from the fall of 1912 to 1916 with other feeds, and one lot was maintained exclusively on cottonseed meal and silage in the ratio of 1:40. During the winter of 1912, a lot (Lot IV) of 10 head of yearlings were kept in good growing condition and gained 149 pounds per head, at a daily cost of 5.5¢. A similar lot of calves on a rotation of alfalfa, stover, shelled corn, cottonseed meal, at a daily cost of 9.9¢, made a gain of only 116 pounds for the period. During the winter of 1913-14, some oat straw was substituted in place of the silage and decreased the daily cost .8 ¢, but also decreased the gains in proportion. Where other feeds were combined with silage in the winter test, the gains decreased and cost increased. These same results are shown in the table for the winter of 1914-15. While the difference in feed cost is not so great, there is a difference in favor of cottonseed meal and silage.

Table IX for the winter of 1915-16 shows the various combinations of cottonseed meal, silage, and oat straw, the cottonseed meal and silage in the ratio of 1:40 and straw increasing from Lot I to Lot 3 with a decrease in silage to a 100 per cent silage ration in Lot IV. The daily cost increases from





7.4¢ in Lot I to 10.6¢ in Lot IV, and the gains vary from a loss of 222.5 pounds per cow in Lot I to a gain of 1 pound per lot in Lot IV. The results of the test in every case point to the economy and efficiency of corn silage in the winter ration of beef cows.

#### THE LONG-CONTINUED USE OF CORN SILAGE.

One of the problems involved in the series of investigations at the Illinois Station and which received first consideration was the exclusive use of corn silage and cottonseed meal in the winter ration of beef breeding cows. At the beginning of the experiment, in the fall of 1912, one lot of calves was started on a ration of corn silage and cottonseed meal. They were kept on dry lot and bedded with shavings. These heifers were maintained on this ration until they had reached maturity and dropped their first crop of calves, at which time one-half the cows were taken out of this lot for another phase of the experiment. The remaining five cows were carried through two pregnancy periods, four years, on a ration of corn silage and cottonseed meal alone. Table XIII is an extract of other tables that included this particular lot and briefly summarizes the data obtained.

The table shows the average daily ration for the different seasons, cost, weights and gains of the cows, and birth weights of the calves. The average daily ration varies from 25 pounds of silage and .625 pound of cottonseed meal during the winter of 1912-13, to 40 pounds of silage and 1 pound of cottonseed meal after the heifers had reached maturity. The cottonseed meal and silage were kept in the ratio of 1 to 40. The weights and gains, as shown in the table, show a normal growth. These weights do not show the highest weight which the cows may have attained as they were taken between the winter and summer period. The heaviest weights were made before parturition and the smallest weights during the summer when the cows were heavily suckled.<sup>1</sup>

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1. Busk, H. P. Corn Belt Beef Cattle Industry in War.



The table shows an 80% calf crop for the summer of 1915 and a 100% crop for 1916. No other lot of the experiment produced as good a calf crop on the average as this lot did. The average birth weights of the calves in 1915 and 1916 were 77.75 pounds and 76.5 pounds respectively. These weights are larger than the average in the other lots. The majority of the calves were heifers, and the records of the lots show that the birth weight of bull calves is considerably larger than the weight of the heifer calves.

#### CORN STOVER SILAGE.

The prevailing method of siloing corn seems to be the siloing of the entire corn plant. In some instances, the market price of corn tends to operate against the practice of utilizing corn this way. It is possible, however, to silo the stover alone but this necessitates harvesting the ears before they are mature enough to crib. The Illinois Station siloed the green ears and stover separately in the fall of 1916. The green stover gave good results in the maintenance of breeding cows. 70 pounds of this stover silage and 1 pound of cottonseed meal per head daily kept the cows gaining a little more than 1.5 pounds per head per day for approximately two months. The green ear corn silage gave encouraging results in fattening calves. This meagre information led to a thorough study of the situation by Dr. H. S. Grindley and Professor H. P. Rusk. They were led to believe that it would be feasible to cut the corn at the proper time for shocking, allow it to stand in the shock until the ears had cured sufficiently to crib, and then silo the stover. This proposition was outlined to the Association of American Portland Cement Manufacturers, and they became interested enough to secure the donation of cement for the construction of a battery of six concrete silos. These silos were filled as follows:

Silo No. 2	-	green stover
Silo No. 4	-	dry stover and 8 pounds water to 12 pounds of stover.
Silo No. 5	-	dry stover and 10 pounds water to 12 pounds stover
Silo No. 6	-	dry stover and 12 pounds water to 12 pounds stover.





Silo No. 7 - dry stover and 12 pounds water to 12 pounds stover +  $\frac{1}{2}$  of 1 $\frac{1}{2}$  of Blackstrap molasses.

Silo No. 8 - normal corn silage

This stover was siloed about January 1. On January 26, 50 cows were divided into lots of 10 head each and an experiment was carried on for a period of 98 days as shown in Table XI. The silage was fed out of silo No. 4 at the end of 84 days and green stover silage from silo No. 2 was substituted. The silage in silo No. 5 was fed out at the end of 76.5 days and the silage from silo No. 7 substituted. The silage in silo No. 6 was fed out at the end of 42 days and the silage from silo No. 7 substituted. The normal silage from silo No. 8 lasted through the entire experiment. A study of this table shows that the silage from silo No. 5 was the most efficient in maintaining the cows and was the cheapest ration used. The cows of this lot did not lose an average weight equal to the weight of the calves dropped. The birth weight of the calves averages larger than the weights of calves dropped previous seasons. There were a total of 31 calves dropped in the stover lots. Two of these were born dead and one other died soon after it was dropped. These calves were all small, two of them being a pair of twins, that weighed 22 pounds each. The author took the other calf away from the cow and it appeared to be somewhat immature and malformed. All of these calves were in the same lot. All the rest of the calves dropped in the stover lots were strong and healthy. One cow in Lot III dropped a pair of twins, one bull calf and one cow calf that weighed 57 pounds and 60 pounds respectively. The initial weight of this cow was 1180 and final weight was 975, giving a loss of 205 pounds. All the cows of this lot were in good thriving condition at the close of the test. In Lot IV one cow dropped one bull calf of 63 pounds weight on April 26, and on May 1 dropped a cow calf of 73 pounds weight. The initial weight of this cow was 1000 pounds and final weight 885 pounds, a loss of 115 pounds. This loss



of weight is 21 pounds less than the birth weight of the two calves, showing that the cow actually gained while suckling the twins. See Plate IX. The condition of the cows of all lots and their winter quarters are shown in Plates VI, VII, and VIII.

#### PALATABILITY TEST

In order to determine the relative palatability of the silage used in the winter experiment of 1913, 26 cows were put on the test at the pure bred barn. The theory was to feed the cows silage ad libitum from the battery of silos in separate bunks and record all refused silage at the end of the test. For the first few days the cows cleaned up all silage and the feed was weighed proportionately. At the end of two weeks after the cows had become accustomed to the silage, the test was closed and pictures taken of the arrangement of bunks for the test and the amounts of silage left in the bunks. The results of this test are shown photographically in Plate X and XI. These plates show that the degree of palatability ranged as follows: 1st silo, No. 5 - water and stover 8 - 12; 2nd silo, No. 2 - green stover; 3rd silo, No. 4 - water and stover 8 - 12; and 4th silo, 6 - 7 water and stover in equal amounts and  $\frac{1}{2}$  of 1% of Blackstrap molasses respectively was the least palatable.

#### MISCELLANEOUS DATA

The first available data on the subject at hand were obtained from an experiment at the University of Illinois conducted by Professor H. W. Mumford.<sup>1</sup> The object of the experiment was to compare cheap feeds readily available on Illinois farms for maintaining beef breeding cows. Feeds were siloed which are not considered as cash crops of the farm, but those which are usually allowed to go to waste. The corn plant in some form was used as the basis of the

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1. The Maintenance of Beef Breeding Cows. Mumford, Herbert W. Ill. Bul. 111.





winter feeds. Three lots of ten head each of grade Aberdeen Angus cows were wintered as shown in Table XIV.

A study of the table shows that the cows in Lot 1, or the silage-fed lot, made the highest gains of any lot, but at more than twice the cost. These cows were weighed individually and also by group. From the weights, it was found that, beside the cows which calved, there were three cows in Lot 3 that lost in weight, one losing as much as 100 pounds, while one cow in this lot gained 136 pounds. In Lots 1 and 2, no cows lost in weight, except those that calved before the end of the test. During the progress of the experiment, the cows in Lots I and II were noticed to be in much more thrifty condition than the cows of Lot III.

Practically the same areas of corn were used in Lots I and II, that is, an equal amount of corn was fed to these two lots, but one received its corn as corn silage and the other in the form of shock corn. From the table it will be seen that shock corn, corn stover, or shredded stover in combination with other feeds is much the cheapest ration, but the condition of the cows on this ration shows that it was least efficient.

During the winter of 1915-16, Mr. E. W. Sheets maintained three lots of cows of ten head each on the rations and obtained results as shown in Table XV. This table shows that corn silage in combination with mixed hay and wheat straw did not satisfactorily maintain cows approximating 850 pounds in weight. The addition of 1.5 pounds of cottonseed meal and 5 pounds of silage per head daily greatly increased the efficiency of the ration. A daily ration of 10 pounds of mixed hay, 15 pounds of shock corn, and 2.1 pounds of wheat straw did satisfactorily maintain cows of approximately 850 pounds in weight. Mr. E. M. Sheets, of the West Virginia Station, recommends the rations tabulated in Table XVI as efficient rations for wintering breeding cows.<sup>1</sup>





Mr. S. H. Ray,<sup>1</sup> of the U. S. Department of Agriculture, recommends the fattening rations for maintaining beef breeding cows of 1000 pounds weight.

Ration 1		Ration 4	
Corn silage	40 pounds	Corn stover	20 pounds
C.S.M.	1.5 "	Corn	3 "
		Alfalfa	4 "
Ration 2		Ration 5	
Corn stover	10 pounds	C.S.M.	2 pounds
Corn silage	30 "	Corn stover	10 "
Oat straw	5 "	Johnson grass	20 "
C.S.M.	1 pound		
Ration 3		Ration 6	
L.S.O.M.	1 pound	L.S.O.M.	.75 pound
Shredded stover	20 pounds	Corn and cob meal	4 pounds
Clover hay	4 "	Hay (non-legume)	15 "

The above rations are probably efficient, particularly in some sections of the country where these feeds are grown. Ration No. 1 is exactly the same as will be found for the ration that successfully maintained beef cows at the University of Illinois, except it contains .5 pound more of cottonseed meal.

In an experiment conducted at the Indiana Experiment Station to test the feeding value of oat straw, it was found that a ration of corn silage, corn, and cottonseed meal was just as efficient for economy and extent of gains when used with oat straw as when fed with clover hay. The same station recommends the following ration as being suitable for wintering beef breeding cows:<sup>2</sup>

Ration 1		Ration 3	
Oat straw	10 pounds	Oat straw	10 pounds
Silage	20 "	Shock corn	10 "
C.S.M. or L.S.O.M.	1 pound	C.S.M. or L.S.O.M.	1 pound
Ration 2		Ration 4	
Straw	20 pounds	Stover	35 pounds
C.S.M. or oil cake	2 "	C.S.M. or L.S.O.M.	1 pound

1. Ray, S. H. Ill. Farmers Bul. 811:1-122. 1917.  
2. Purdue Ag. 11:22-3. Feb. '17.



These rations would appear somewhat light in comparison with other rations that have given good results.

Mr. B. O. Severson<sup>1</sup>, of the Pennsylvania Station, maintained one lot of Shorthorn cows and one lot of Aberdeen Angus cows for three years with feeds and results as shown in Table XVII. In writing of the results of the experiment, in Pennsylvania Bulletin 150, Mr. Severson says: "Beef breeding cows were maintained during the winter months in good breeding condition on a ration of corn silage in amounts to satisfy the appetite, supplemented with either cottonseed meal (Lot II) or linseed meal (Lot I) at a rate of one pound per cow daily. These supplementary feeds have, for all practical purposes under conditions of this experiment, a similar feeding value. The linseed oil meal was more expensive and caused slightly more laxative effects than cottonseed meal. Cows nourishing calves consume more feed than cows without calves. Cows of the Aberdeen Angus and Shorthorn breeds were maintained equally well in this investigation. On a live weight basis, the air dry matter in feeds consumed was identical in both lots. Where corn silage contains more than 75 per cent of air dry moisture (water) it should be supplemented with other dry roughage, since the feed capacity of the corn is not sufficient to prevent excessive losses in weight, particularly by "deep milking" cows nourishing calves. Only one cow was "off feed" during the three winters reported in this bulletin. Their appetites were keen at all times." Mr. Severson reports in the same bulletin the annual cost of maintaining beef breeding cows at varying prices of feed and total expenses of cows as shown in Table XVIII.

The summary of pasture experiments at the Pennsylvania Station is shown in Table XIX. In writing of the summer maintenance of the two lots

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1. Severson, B. O. Pa. Bul. 150.





of cows, Mr. Severson says: "The cows were kept on blue grass pasture with calves at their sides during the summer months. It was found that for profitable beef production the utilization of pasture to the greatest possible extent is necessary. The pasture was allowed to reseed itself by conserving the grass in early spring, in order to maintain a surplus of grass during the mid-summer. Therefore the cattle made their greatest gain during the summer months. Alternating the stock on two pastures at two-week intervals improved the pasture grass. Over-grazing in the fall caused late pasture in the spring. The pasture used in this investigation was improved by grazing out the first three years of the investigation to the extent of 15 per cwt. in the summer of 1915; 19 per cwt. in the summer of 1916; and 23.3 per cwt. in the summer of 1917 (based on increased number of cattle on same area)."

Professor W. A. Cochel<sup>1</sup> of the Kansas Station has just finished a winter test in which he used Hereford cows. The feeds used and results obtained are shown in Tables XX and XXI. From Table XX, it will be seen that Lot 7, receiving silage, wheat straw, and corn fodder, was maintained satisfactorily in weight at approximately one-third the cost of the cows in the other three lots, but this lot produced only a 40% calf crop.

At the Kansas Fort Hays Station, Cochel<sup>2</sup> maintained sixty-four mature beef breeding cows from December 16, 1914, to April 14, 1915, to obtain some data regarding the most economical methods of wintering beef breeding cows. The total amount of feed used was 57.75 tons of kafir silage, 15.86 tons of kafir stover, 16.64 tons of wheat straw, and 23.37 tons of alfalfa hay, supplemented with 4,632 pounds of linseed cake and 2,970 pounds of cottonseed cake. The total value of the feed used was \$480.10 or \$7.50 per head.

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1. Cochel, W. A. Rations for Wintering Breeding Cows.

2. Kansas Industrialist. Vol. 41, May 1, 1915.



One lot of cows was wintered on the open range at a total cost of \$8.84 per cow for feed and labor as compared with \$8.23 in the lot with access to an open shed. In a comparison of linseed and cottonseed cake, it was found that the cows which were fed one pound of linseed cake daily as a supplement made a slight increase in weight, while those fed the same amount of cottonseed cake did not quite maintain their original weight. This difference was probably due to the fact that a greater proportion of the cows that received cottonseed cake had calved when the final weights were taken.



## SUMMARY OF PROJECT 225.

1. During the summer of 1913, blue grass pasture gave slightly better results than red clover when both were supplemented with alfalfa, requiring 1.39 acres and 1.44 acres respectively to carry a two-year-old heifer through the grazing season. On a dry lot, it required .208 acres in terms of silage to carry a yearling heifer the same number of days.

2. During the summer of 1914, blue grass pasture supplemented with cottonseed meal and silage gave 190.17 pasture days against 88.78 pasture days on blue grass pasture supplemented with alfalfa hay and oat straw.

3. The results of pasture tests during the summers of 1915, 1916, and 1917, show that the smaller the area of pasture and the greater the amount of silage substituted, the fewer the acres required per cow and the greater the number of pasture days per acre.

4. During the summer of 1916, spring-sown sweet clover pasture without supplement gave 128 pasture days against 98 pasture days on a mixed pasture supplemented with silage and cottonseed meal.

5. During the same season a second season's pasture of sweet clover gave 147 pasture days per acre with the aid of 2.675 tons of alfalfa hay as a supplement.

6. Since this series of investigations began, there have been only two seasons when 1.5 acres of blue grass pasture would carry a cow suckling a calf through the grazing season.

7. During the winter of 1912-13, silage and cottonseed meal proved just as efficient for maintaining yearling and two-year-old heifers as a ration of alfalfa hay, shelled corn, corn stover, and cottonseed meal, and at practically one-half the cost. These results were repeated in 1913-14.





8. During the winter of 1914-15, a ration of silage, cottonseed meal, and oat straw, proved to be more efficient and cost approximately only three-fourths as much as a ration of broken ear corn, alfalfa, and oat straw.

9. The larger the percent of oat straw in a ration of silage and cottonseed meal, the less efficient and cheaper the ration.

10. Breeding cows can be successfully grown from calfhood to maturity and through two periods of pregnancy on a ration of corn silage and cottonseed meal alone, without affecting their normality or that of their offspring.

11. Feeding cut oat straw mixed with the silage did not economize or increase the efficiency of the ration.

12. Green stover silage and dry stover silage, when fed according to appetite, are as efficient in maintaining breeding cows as normal silage when limited to 40 pounds per head daily.

13. From a general economical standpoint under present conditions, it will pay to winter breeding cows on the by-products of the corn-grazing industry and conserve the grain for other uses.

14. When the market price of corn falls back to normal, this practice may not be so economical as at present.



## PART II

## PURE BRED CATTLE AND SHOW HERDS

There is a close relationship between market cattle and pure bred cattle. The breeder of pure bred must have a place for his cattle which are not good enough to use for the raising of breeding cattle. On the other hand, the breeder of market cattle has a place, at the head of the herd at least, for a pure bred.

There seems to be no available data on the exact cost of maintaining the pure bred herds and show cattle. It has been possible, however, to collect from various sources some information as to how the most successful breeders and showmen manage and feed their cattle.

## IN THE CORN BELT.

Probably one of the earliest and most influential men in the beef cattle business in modern times was Thomas Clark, of Beecher, Illinois. Writing on practical herd management in *The Story of the Herefords*, he says:

"In regard to my method of handling a breeding herd, I shall first of all tell how I would handle the breeding bull. He should be kept in good breeding condition. I think some breeders keep their breeding bulls too thin. I believe a bull will sire calves with stronger constitutions and better flesh carriers if he is maintained in good flesh. In managing my breeding bulls I kept them away from the cattle as much as possible, giving them good roomy stalls with small yards adjoining so they could get all the exercise needed to keep them straight on their legs and active. I fed equal parts of ground corn and oats with a little bran and oilmeal added, and fed





three times a day about all they would clean up. But be sure that they clean it up at all times. Also feed good sweet hay; I prefer clover to any other kind.

"I managed my breeding cows as follows: I preferred to breed them so that they would have calves from Jan. 1 to April 1, except a few that I wanted to have calves for show purposes. Those I would breed to calve from Sept. 1 to Jan. 1. All cows that would not have calves until February and up to April I kept alone in a yard with an open shed well bedded, so that they could go in and lie down comfortably. If kept in that way they are more healthy and their calves will be stronger and more thrifty. Besides you save labor and feed. I believe that the less you move cows around while pregnant the better. Two or three weeks before they were due to calve I took them up and put them in loose boxstalls, and fed them liberally on ground corn and oats with a small allowance of oilmeal. After calving let the calves run with them for three or four weeks in the boxstalls so that they can suckle whenever they wish. But I would turn the cow out in the morning, and put her back in the stall at noon and feed her after the calf had nursed. Then I would turn her out again until evening, when I would put her back in the stall for the night with her calf. After the calf is four weeks old separate cow and calf, suckling the calf twice a day. Place shelled corn and oats in a trough where the calf can go and eat at will. You will be surprised how quick it will begin to eat.

"When grass came I turned cows and calves out together on pasture and let them run until flies got bad, and then took the calves up and fed as before, brining the cows in mornings and evenings and letting the calves suck. I separated my bulls from the heifers, and fed the bulls all they would eat of ground corn and oats, equal parts, with a little oilmeal.



"I would not breed heifers until eighteen to twenty months old, so as to have them near three years old when dropping their first calves. I would breed them so as to have their first calves in the spring if possible, in order to get them quickly on grass, which will make them give more milk for the calves."

In a brief resume of how the Harris herd is handled, Mr. Harris, writing in The Story of the Herefords, says:

"Our Hereford breeding herd since its establishment twenty years ago has been handled in as practical and economical a manner as we have known how to practice. Our pastures are more or less protected by timber, and many cows in our herd have never seen the inside of a barn or shed. Located in one of the best bluegrass regions of the world, the summer ration of our herd is bluegrass - plenty of it and nothing else.

"During the early winter stalk fields and bluegrass which has not been heavily grazed furnish an abundance of feed. Later, corn fodder, clover and timothy hay are supplied as required to keep the breeding herd in strong thrifty condition. In the late winter and early spring months cows that are heavy milkers, and we have many such in our herd, are given a little extra feed - anything in the form of corn chop or cottonseed. We find that the rugged hardy constitutions of the Herefords do not require that they be provided with expensive barns for winter shelter; in fact, we do not even find it necessary to provide sheds of any kind for them. We have never, even during the most severe winters known in this section of the country, found it necessary to give our older cattle protection, and we have never had losses from exposure. By this method our breeding herd is carried through the year at a minimum cost and maintains a very thrifty and healthy condition.





"Calves, except those intended for show purposes, are allowed to run with their dams on the pasture during the summer. When old enough to wean they are placed in a pasture or yard by themselves and are given a light grain ration during the winter, and except in the most severe weather are never housed at all. During the second summer bluegrass is their chief diet and they seldom if ever taste grain again. Our heifers are bred at from eighteen to twenty-four months of age and it is seldom that we find it necessary to give a heifer any assistance in the way of feed while nursing her first calf, except what she gathers herself. Young bulls generally require a light feed of grain once a day during their second summer to insure the best development and growth.

"Our herd and stock bulls, all of which have at some time been grand champions in the leading shows, are not kept in extremely high condition after we are through exhibiting them. They have the run of small grass paddocks. This gives them an opportunity for plenty of exercise and an abundance of fresh air and a sun shed, our aim being to keep them in strong vigorous condition. Beau Donald 5th, now sixteen years old, has been handled in this manner and is still active and doing good service.

"Our experience with close in-breeding has been very limited, as we have never looked with a great deal of favor upon such a practice. It is our belief that it should only be undertaken in the hands of the most skillful breeders, and then only with such animals as are practically perfect in every respect. We have never kept an accurate account of the exact cost of maintaining our breeding herd, but we do know that our Herefords have made us plenty of money, as well as being the source of a great deal of pleasure and satisfaction."





One of the breeders and showmen, whose name has recently become familiar among the pure bred cattlemen, and who has made an excellent showing with beef cattle, is Robert H. Hazlett of Eldorado, Kansas. Writing on practical herd management in *The Story of the Herefords*, he says:

"I shall state in the beginning that I believe in giving the young animals a chance. With this in view I try to grow them out as much as possible, keeping them at all times in good thrifty condition - not striving to make them fat, but on the contrary to produce real development by feeding for flesh, bone and size.

"Speaking of the heifers, specially: From the time they are weaned they are kept separate from all other cattle, in pasture in summer and in corrals, with open sheds for protection from storms, in winter. During the time they are not on pasture they are fed a grain ration consisting of a small percentage of corn, a larger percentage of barley usually, and a considerably larger percentage of oats. All this feed is ground and fed mixed with kafir corn and cane silage or cut cane fodder and alfalfa hay. In addition to this mixed feed they have as rough feed cut cane and alfalfa hay with occasionally a feed of prairie hay as a change of ration. They get practically no grain during the summer, although at times when the weather is dry and the grass not very nutritious it is necessary in order to keep them in condition to give those under one year old a light feed of grain once a day. The older ones have no grain in summer. It is my opinion that better breeding animals result from being handled in this way than if they are allowed to become stunted in any degree because of lack of proper nourishment during the developing period.

"After the breeding cows are two years old, with an occasional individual exception for a short time, they get no grain ration whatever, either summer or winter. They have the bluestem grass pasture for summer



feeding and are wintered mainly on sorghum and alfalfa. Most of this feed is run through the cutter, and lately the sorghum is fed in the form of silage. Except those near calving and those having young calves, the cows are not put in barns at all, but for protection run to sheds open to the south during the winter months. Whether in pastures in summer or in lots in winter, I like to keep the aged cows, two-year-old heifers, yearling heifers and heifer calves separate.

"The bull calves are fed and handled in much the same way as the heifers, except that they are not allowed to run with the dams in pastures beyond the time they are around four to five months' old. After that and until they are weaned they are kept in lots near the barn, the cows being brought in and the calves suckled twice a day. After being weaned they are not fed in open lots as are the heifers but are tied up and fed, each one by himself. We have what we call a 'bull barn' for these weanlings where they remain until sold. Around this barn are several lots in which these calves are kept, a few in each lot. They are in these open lots practically all the time, except when brought in for their feed of grain. I find that they do better when I feed them separately in this way than when I attempt to feed a number of them together. In the open pens they get the benefit of fresh air, sunshine and exercise.

"From the time our herd bulls are herd bulls are from twenty-four to thirty months old, being practically matured, they have a very light grain ration, usually once a day, with alfalfa hay, prairie hay and cane fodder. Each has a separate lot and an open shed, never being kept in barns. They are not kept fat, but in good thrifty condition.

"My first purchase of purebred Herefords was that of an entire herd consisting of only fourteen females, cows, heifers and heifer calves, and two bull calves. One of the cows was by Stonemason by Beau Real by Anxiety





4th. This cow was the dam of one of the bull calves, his sire being Wild Beau by Beau Real. Wild Beau was a full brother to the famous Wild Tom. All the younger females in the little herd were sired by Wild Beau. I retained this calf, out of the Stonemason cow, and used him on all the cows and heifers except his dam. I was without experience as a breeder at that time and knew practically nothing of different bloodlines or the different families, but the results of this very conservative close breeding were quite satisfactory and my young bulls found ready sale at fair prices from the beginning. I did not offer for sale any of the cows or heifers.

"To avoid breeding heifers to their own sire I soon bought another bull, a very good individual with a greater concentration of Anxiety 4th blood than anything in my herd at that time, and the results from his use proved very satisfactory. In fact, there is no doubt but that there was an improvement in the produce of my herd from his use. Later, when the heifers sired by this bull were coming of an age to be bred, having the prevailing idea that too close breeding was to be avoided I bought two young bulls of different breeding from my cows and from each other. One of them was a son of a famous show bull. Each was a good individual and of a family very popular at the time. These were used in the herd but with quite disappointing results, so much so that I disposed of both of them. Before they were sold, but after I had decided to dispose of them, I bought a third out-cross, a show bull with quite a record, a half-brother on his sire's side to a very famous prize-winner which was grand champion at the larger state fairs, the American Royal, and the International. This purchase was also an outstanding individual, but the results in my herd from his use were even more disappointing than those from the use of the two preceding him and he also was disposed of. I then decided to return to the Anxiety 4th breeding



through sons of Beau Brummel and others tracing to Don Carlos, by Anxiety 4th, and have continued in the same line to the present time.

"From my experience with out-crosses I am compelled to believe that whatever success I may have attained as a breeder is due largely to the fact of persistent close-breeding. At least, so far the results of such close-breeding as has been practiced at Hazford Place have been very satisfactory. Undoubtedly some other elements have incidentally entered in, for instance, selection and environment. Both of these, however, are necessary to real successful constructive breeding in any herd.

"While it may possibly be true that the persistent promiscuous breeding of closely related animals, without discrimination or selection, may bring greater disaster than the persistent mating of promiscuously bred animals, yet from my observation and experience, if only worthy animals, those of good conformation, quality and breed character, are used for breeding purposes the ultimate results are bound to be better in the closely bred herd, producing offspring more uniform in type and more uniformly equal or superior to either sire or dam. After all, this is only another way of saying that 'like begets like or the like of some ancestor.'

"If it is possible that close-breeding in itself will produce a weakness or defect in the offspring when both sire and dam are of outstanding merit, neither having this weakness or defect and both tracing back to the same ancestors of equal merit, there must be for such a result a demonstrable scientific reason. So far investigators and students of the science of breeding have not discovered any physiological or other scientific reason. If neither sire nor dam, however closely related, has a certain or particular defect or weakness and none of their ancestors has been affected with such defect or weakness their offspring will not have it as a result of this mating.





The quite common notion that it is otherwise, and that defects and weaknesses are the necessary results of blood concentration, undoubtedly had its origin in sentiment and survives on 'common report,' scarcely anyone having attempted to solve the problem by persistent, patient, personal effort.

"Custom may make law, but tradition never established or created a physical or scientific fact, nor can folk-lore make or change a law of nature."

C. A. Tow has to his credit a marked success in the development of a pure bred herd, and in recent shows. Writing on practical herd management in *The Story of the Herefords*, he says:

"It is about eight years ago since I became the owner of my first registered Hereford cow. It was bread and butter with me, so every cow had to make good. The cows of breeding age will care for themselves if given half a chance. We always aim to care well for the younger ones. Our cows are all run on grass in summer and those giving milk or heavy in calf are housed in winter. We feed nice clean oat straw in connection with silage for winter roughness. The young calves and yearlings are always run in paddocks around the barn where they get their feed. We always keep our calves separate from their dams. They are suckled in barns or yards. Our yearling heifers and short two-year-olds are left to run in open sheds in winter and are fed their silage and hay in racks. We breed everything at the halter and never breed a heifer younger than nineteen months. Our young bull calves are separated from the heifer calves at about four months' old. We try and grow them all alike, giving them all an equally good chance to make good. Our herd bulls are housed in winter and grained daily the year around, except for only a few months in summer when grass is good their grain may be shut off. They have boxstalls to run in when in the barns.





"In regard to the 'doubling in' of blood in the breeding of cattle, I am very much opposed to the practice as a general proposition. I know that in some cases it has brought good ones, but we sometimes forget to mention the cases where it has failed. I may add that the cattle business has been a success with me thus far, and I believe that the beef cow is as sound an investment as a farmer can make."

One man, whose judgment is almost universally recognized and respected in the beef cattle industry, is John Letham. Writing on practical herd management in *The Story of the Herefords*, he says:

"The management of a breeding herd is not a very complex problem if you keep close to nature. Abundant pasture and pure water easily reached in summer, well ventilated barns for the cows and young calves and good, dry, well bedded open sheds for the yearlings and two-year-olds in winter are all that are necessary for success. If these simple requirements were followed we would hear but little about abortion, tuberculosis, scours, foul-feet and many of the troubles that plague the caretakers and dishearten the owners. It is astonishing in going over the country how many cattle one finds which have insufficient pasture and filthy water, or only water at intervals. And yet they are expected to make good returns for their owners. In winter the conditions are deplorable even with men who mean well. Many of the costly bank barns are hotbeds of disease. Ventilation was never once considered by the architects and drainage was entirely forgotten, even where the cupola is a work of art resembling Joseph's coat of many colors. Go into such a barn at 5 a.m., where 50 to 100 cattle are housed. The hot, moist atmosphere meets you; it is past being unsanitary; it is impure, death-dealing to man and beast alike. At 8 a.m. these cattle are turned out into a yard resembling a hog wallow, there to stand in the storm or zero weather till 4 p.m. And breeders will talk about having bad luck! This is not an overdrawn picture.



It is only too common and surely means the survival of the fittest in the end!

"Then managing a breeding herd the bull is half the herd at all times, so we turn to him first. A paddock of 2 acres or less with a comfortable shed and boxstall in one end makes the ideal quarters for the herd bull. The shed should have a loft above to hold the hay and straw, so as to be handy in winter and to keep it cool in summer. Then you can have the breeding pit under cover in the shed. In many of the states no door is necessary. Let it open to the south and the bull will generally use good judgment. Should the young bull be lonesome turn a cow safe in calf with him for company. In this way you will conserve his virility and lengthen his life and usefulness. Feed him enough to keep him strong and vigorous all the time without loading him up with a lot of superfluous inside fat or outside tallow. Blood, bone and flesh are what you want in a herd bull. After getting his growth he should never vary 100 pounds summer or winter. This letting down and building up procedure is always disastrous. So far as my experience goes the single service gets as many calves as the double or triple service, provided the cows are in proper season and healthy. A radical change of pasture during a dry spell, ergot on the grass, changing to silage, heavy feeding of cottonseed meal, etc., have been the causes of charging up many a bull with unsatisfactory service.

"The pregnant cow should always be the herdsman's special care. She only drops one a year on an average. To save a good calf means to save a large part of the herdsman's salary, sometimes a year's salary. And right here is where you find the greatest difference in herdsmen. Keeping the cows bred up and saving the calves, far more than makes or loses the salaries of the best men. When the matron that is due has been on grass and raised naturally little need be done, the calves usually coming strong and healthy. The calves dropped on the green sod seldom get infected. Of course you have always the





maggot, the screw worm or coyote to remember, depending on your location. The commonest evil is too much new milk at birth. Stale milk has killed many a calf. Therefore see to it the mother is properly stripped once daily even at pasture, and more especially should there be a retention of the placenta. It is astonishing how little the calves need to live on during the first week and how much damage can be done by too much, especially if the milk is stale or the mother at all feverish. In winter the calf cot is all-important. It should be cleaned and aired out every day and a little slacked lime sprinkled. It is always worth what it cost in the field. Do not wait till your calves get the scours, coughing, wheezing and running at the nose, then rush to town for disinfectants and diarrhoea medicine and have a general housecleaning and a lot of sick calves. Prevention is always wise.

"The young calf is better beside the dam from 3 to 6 weeks of age. Then it can be put in the calf cot and nursed twice daily, 12 hours apart. This is especially good with a heifer's first calf. It develops her udder and makes her a better mother in the future. Supply the calf cot with the choicest morsel or hay and have shelled corn, oats, bran and a little oilcake in silage, so they can nibble at will. What good millers they are and how they enjoy doing their own grinding. But a word of caution about silage: Never let a young calf get frozen or musty silage. Alfalfa is rapidly replacing roots and silage, but I still believe good silage the best substitute for milk.

"The yearlings and two-year-olds in the open sheds need lots of roughness and should have some grain. Never let them stop growing a day if you expect to raise good young cows at the least possible expense. And remember that water is an all-important factor in winter as well as summer - not once every other day or a bellyful of ice water once a day. What a mint of money is lost in the cattle business in this country for want of water



summer and winter!

"Alfalfa and silage are rapidly changing feeding conditions throughout this country but the general principles are still the same. It is still the good herd bull and the breeder who stays close to nature, watching the little details which the other breeder ignores, that forges ahead and gets the ripe persimmons."

There is no doubt but that Warren T. McCray of Kentland, Indiana, has, by common consent, climbed to a plane, in the beef cattle business, that is reached by only a few of his contemporaries. In practical herd management in *The Story of the Herefords*, he writes as follows:

"Regarding the management and feeding of a herd I would suggest that one of the most necessary attributes of a successful cattle manager and feeder is a liberal endowment of good wholesome commonsense, or it might be more nearly correct to say good cattle-sense. There is a distinction between the two that comes naturally and they in whom the two are combined are the most successful cattlemen. I have never made any great discovery in the feeding and management of my herd. One's success or failure depends upon the care and watchfulness of the feeder. He must be regular, attentive and watchful. He must know the particular characteristics of each animal under his care and cater to them, so that the animal will at all times do its best.

"I am a great believer in the out-of-door life for the breeding herd. Nature has made laws which have never been improved upon by man. The only thing to watch is that the cattle have plenty of feed and water. Do not over-stock the pastures. Leave plenty of feed in them for fall and winter. Last winter I kept a bunch of dry cows on a good blue-grass pasture until the middle of January and they were as fat as one would wish when removed.

"We commence feeding our calves as soon as they are old enough to



eat and keep this up until they are past the yearling stage. I have several small lots or grass paddocks and the young bulls are divided up and placed in these over night, but in the day time they are put in their stalls to protect them from the flies and heat. We commence to breed the heifers when they are from twenty to twenty-four months of age, and begin to use the bulls lightly when they are about fifteen months old. I have never practiced in-and-in-breeding to any great extent as I always considered it a dangerous proposition. However, I am now conducting some experiments by breeding some daughters of Perfection Fairfax to some of his sons which had dams with a decided out-cross and whose strong characteristics I want to maintain. I am hoping for satisfactory results but at this time I am not qualified to speak from experience on that subject.

"I have found a great deal of pleasure in the pursuit of cattle-breeding. The acquaintances and friendships formed among cattlemen are the most loyal and lasting that can be made. The business has also been most profitable, but aside from this there comes great pleasure and satisfaction in the feeling that one is really doing something in the world that is worth while, in trying to produce and improve an animal that contributes more to the support and material welfare of humanity than any other."

#### IN THE BLUE GRASS REGION.

The firm of Luce and Moxley has seen no long stride to prominence in the pure bred cattle business. In practical herd management in The Story of the Herefords, Mr. Moxley writes as follows:

"In this part of the state we usually have good bluegrass for grazing from May to middle of December. Our Herefords need no attention as far as feeding goes during this season. The calves that come during this season are left with their dams until bad weather comes, when they are taken





to the barn and if old enough are weaned and fed a mixture of corn, oats, bran, and either cottonseed meal or oilmeal.

"The cows with calves at side are fed silage, cottonseed meal and a little hay. These cows are kept up at night and run to shock fodder in the day-time if the weather is not too bad. The dry cows are left out and run to a strawrick and shock fodder, unless we have a mean spell of weather, then they are fed a little hay. We aim to start our cows into the winter in the best shape possible. The cows that calve in the early spring are taken up a month before calving and fed the same as the cows with calves at side. By putting the younger calves in pens with older ones they soon begin to eat a little feed. We take the best of care of our calves until they are about fifteen months old. It is our experience that if we do this we have very few of the cheap kind. All of our breeding is done by halter. We have a small herd and find this plan quite satisfactory."

#### FITTING FOR SHOW.

One of the older generation who is prepared to speak on the subject is Jim Powell. Writing on practical herd management in The Story of the Herefords, he says:

"In starting to select a herd for showing I should get yearlings. In selecting these get smooth heifers with plenty of size, something that will make big cows. I would notice especially that they had good heads, with not too large horns, and that they were good in their heart-girths, and had good level backs with straight hind-quarters, and that they came down well in the round and that the tail was not set on too high. I would try to get them as near the same size and type as possible.

"Upon the selection of the bull a great deal depends, for he is more than half the herd. You want a bull to have a good bull's head, not feminine, wide between the horns, and with a short thick neck. He should be



wide between the legs, with a good compact brisket. Be sure that he has good big bones something that can carry weight. Another very important point to notice is that he is good in the heart-girth, and has a good level back and straight quarters. He should have a good thick mellow hide with good coat of hair, which denotes the good feeder.

"In feeding a herd I have found that corn and oats ground together in the proportion of two-thirds corn and one-third oats is a good winter feed. Alfalfa, timothy or clover make good roughness. In the summer I would reverse the ratio, making it one-third corn and two-thirds oats. In starting a young herd about 2 quarts of chops, 1 of bran and a half pound of cottonseed cake three times a day is a good feed. This can be increased to 4 quarts of chops as soon as the cattle get on their feed. However, different animals vary so much in the amount of feed they require, that it is impossible to give any stated quantity. Always be sure your feed-boxes are empty before feeding, as cleanliness is important. Never give an animal more than it will clean up. If any is left in the box, take it out before feeding again. If they do not seem anxious for their feed skip a meal. A little sulphur with their feed twice a week is good to give them an appetite and also to keep them healthy.

"Now, I think calves should have nothing but the cows' milk until they are three months old. Then commence to feed a little cottonseed cake, with oats and bran, as I think cake is the next thing to milk for young calves. When they are six months old, they should have about 2 quarts of oats and bran and a half pound of cake three times a day, besides the cows' milk. Then they will not lose their calf fat after weaning.

"In training young cattle much patience and time are required. In the first place tie them up in their stalls and handle them in there. Then commence leading them out. Have a buggy whip in your hand and make them stand when you want them to. A light cut on the nose will do this. Try to





make them stand with their front feet well under them, not spread apart, and then they will show a good level back. Make them stand at ease. Do not try to do too much at once, as the calf may become sulky. They should have plenty of exercise.

"The young bull should have a boxstall, with a good yard to run in, so as to keep him good on his feet. In the spring, when the grass is good, I would let the herd run out day and night, feeding them twice a day. When the weather gets warmer I would keep them in by day and turn them out by night.

"When the herd is brought back from the fairs great care must be taken to let them down easily. Feed twice a day, taking away about one-third of the feed. In a week or two, this may be cut down to one-half. But do not stop feeding, as you want to keep your herd in good thriving condition. In place of the corn chops, I would now feed about 2 pounds of cake with roughness, and this should carry a herd through."

Ed Taylor's ideas of how to fit cattle for show, as told in The Story of the Herefords, are as follows:

"Much has been written from time to time regarding the fitting and handling of cattle in preparation for the showing, and a few trainers agree as to the variety of feeds and methods pursued in the undertaking. Like the old lady who kissed her cow, it's everyone to their notion. There are no set rules to work by. Animals differ very materially in their dispositions, aptitude to fatten, etc. But there are a few fundamental principles which apply quite generally to the art.

"First of all, the man must be in love with his occupation and charges, and gain their confidence. He should also be a good and impartial judge, and as quick to see the defects in his own cattle as in those of others. One who gets so enraptured with his own as to think they are the only pebbles on the beach is sure to be a bad loser, or as Burns puts it: If nature'd but



the 'giftie gie us, to see oursels as ithers see us." Eternal vigilance must be the fitter's watchword, and regularity and system cut no small figure in the game.

"Having selected the prospective winners and provided comfortable quarters, a light, well-ventilated basement, with well-bedded, roomy boxstalls, makes a nice place and he should be ready for business. In fly time the windows may be curtained through the heat of the day, and no unnecessary disturbance should be allowed around.

"I think that the calves are the easiest fitted members of the herd, and I shall touch on them first. Given plenty of milk and a mixture of grains, if they are of the right kind they will put on plenty of bloom. Calves seem to have a weakness for shelled corn, and this mixed with equal parts of ground oats and bran and kept where they can have access to it at will for the first three or four months of their lives will put them in shape so that one can select those most likely. Occasionally an outstander puts in an appearance, about which there is no question when only a day or two old, but this is the exception rather than the rule. When the calves are about four months old I think it better to feed the corn ground, and add a small amount of oilmeal, feeding what they will clean up at once. Absolute cleanliness of feed-boxes and stalls is essential with all, especially with calves.

"The yearlings receive similar treatment to the calves. Some prefer to continue with the milk portion of the ration while others think it time to call a halt when they graduate from the calf class. With a few exceptions I usually followed the latter course. It is when he gets to the two-year-old and older cattle that a fitter's discretion is put to the test, and right here many a one has met his Waterloo. The time has come now when corn must be handed out sparingly. More oats, a little barley if obtainable, succulent feeds such as roots, and anything that will aid them to hold their





own without a tendency to obesity or patchiness should be used. Ground or cracked wheat is very helpful at this stage, but should be fed sparingly to start with. A double handful of bright clover hay, cut fine with a chaff cutter and mixed with each feed of grain, lightens the ration and makes it more easily assimilated in hot weather. I prefer to dampen the feed just enough to make it gritty, not sloppy.

"Exercise is a very important matter. A small pasture lot handy to the barn so that the females can run out nights through the hot weather, and suitable yards for the bulls are indispensable. All should be well halter-broken and taught to stand properly and show to best advantage. The feet should have close attention and be trimmed when necessary. The coat and skin must be kept clean by brushing and dampening occasionally; too frequent washing dries the hair and causes it to become thin. I never advocate rasping and paring the horns and polishing as we so often see them; it savors too much of the artificial. I think they look more natural with the rough shell and scratches taken out, and just wiped over with an oiled rag.

"There are many small details in connection with the business, and it is a difficult matter to touch on all, but I have tried to cover the ground in a general way. When a boy at home I have often heard my father say, 'One-half goes in at the mouth.' And while there is a good deal of truth in the assertion I think that is a pretty big percentage. As an illustration I recall a remark made by my old friend, Robert Ewart, of Browndale fame, in regard to a cow I was showing at the Minnesota State Fair some years ago. In those days all breeds competed for championship-by-ages and she was a formidable candidate for that honor. After looking her over carefully he turned to me and said, 'If the old bull (meaning her sire) had done half as much for her as you have, she would be a world beater.'





"In preparing cattle for the auction ring the chief object is to have them in as good flesh and as presentable as possible. Fat hides a multiplicity of faults, and while many breeders claim to discriminate against highly finished animals for breeding I notice these are invariably the ones which command the highest prices. Whenever a sale falls flat and prices rule low the reporter's comments usually state the cattle were too thin to warrant the appreciation they deserved, or something to that effect. So there is little to be said other than to have each lot number in good consistent breeding condition (not overburdened, of course), well broken to the halter. Having been washed a day or two previous, and their coats dressed up for the occasion, they should present a good appearance and bring their full value. The vendor who values his reputation will of course guarantee all animals to be breeders.

The show ring and sale ring record of the Fairfax cattle attest the ability of James Hendry as herdsman and manager. Writing on practical herd management in *The Story of the Herefords*, he says:

Before

"I came to America in 1892. ^ I came to this country my experience with cattle was very little, but what I had was with Angus, with Alex. Geddes, Blairmore, Glass. I started with the Herefords at Greenwood, Mo. I was but a helper then. The first summer I used to wish I had the cattle back in Scotland away from flies and heat. But as fall crept on and homesickness left me I began to see I was mistaken. The old imported cows came up in the fall so fat and sleek, and the nice curly calves by their sides made me think I was in the land of promise and made me forget heat and flies.

"I went to Kentucky in the fall of 1901 to take charge of the Beau Donalds and Mr. Curtice had a line-up of calves which was very easy to pick from. They were low-down, chunky fellows with coats of hair like velvet. I always try to get a calf with good back, not too long coupled, nice short head



and good straight hind legs. I commence as soon as I think the dam is not giving enough milk and help out with a nurse cow - not too much to start with, one nurse cow between two calves until grass. Then if prospects are good for show calves, which can be told by this time, I give them a fresh nurse cow and dry up the dams. When about six weeks old I commence to put a little cracked corn and oats in a trough where they can learn to eat. In summer time I keep them in a dark, clean, cool stall away from flies, with plenty of water beside them. But in the winter months I turn them out in a dry lot with plenty of sunshine. But do not stand them in the mud a foot deep all day and expect them to do their best. The better care and feed you give them the first year of their life the better herd of cattle you have. It does not take so much when they are calves. Remember, it is not every calf that comes up to my estimation as a show calf by any means, because they have to have a good constitution and stand up to every meal and bawl for the nurse cow. Bull calves are harder to handle than heifers. They are more restless and sometimes you have to put them in single boxstalls or tie them up.

"And for fitting older cattle I might say a good deal. But of course there are differences in cattle. Some get too hard and the next too soft, so one has to gauge the different feeds on them. I do not believe in too much corn. More breeding cattle are ruined on corn than anything else. I generally mix my feed - bran, 100 pounds; corn, 150 pounds; oats, 150 pounds; cut hay, 30 pounds, and oilmeal, 10 pounds. Towards show time I add a little molasses or something sweet and it makes them eat a little more. And it helps their hair to grow. But remember, never feed them more than they will clean up at any time. Water is as important as feed, as they have to get plenty all the time. Keep your stalls clean and well disinfected all the time, because they love a good clean stall the same as we do a bed. In your spare time in winter get a good stiff brush and brush them, as it makes the hair soft and curly. Use it as much as possible against the hair. Some people try to say





that too much brushing will take out the hair, but I have never found it that way, as the more brushing you give them the better fix you get their hair in. I do not mean to use a curry-comb but a good stiff brush. A curry-comb is liable to pull out the hair.

"As show time draws near wash them once a week. It helps them and also the calves. It breaks their so that when you wash them at the fair they are not so liable to get homesick as the calf generally does the first two weeks after you leave home. The best way to fit a herd is to stay right with it and raise your calves and keep showing them until they are mature cattle. Then you can see something you have done, and are not moving every year as some of the boys do. They cannot know in that length of time what success they are to have, as some years we have better prospects than others.

"In conclusion, I love to raise show cattle from babyhood up. And no one loves them more than I, but when the buyer comes along I am willing to sell and wish him success, and try and raise a better one."

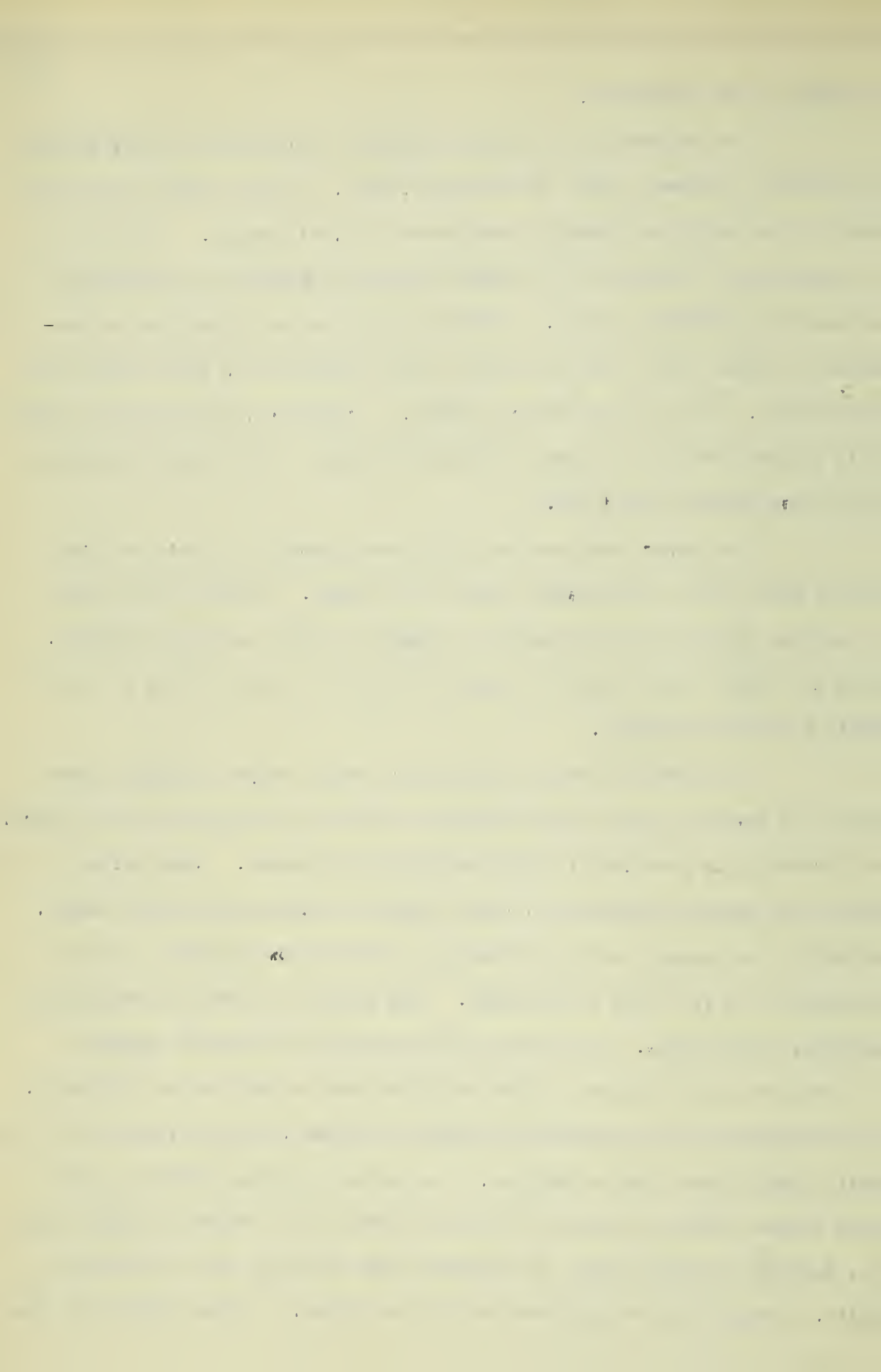


## PURE BREDS AT THE UNIVERSITY.

The University of Illinois maintains a large herd of beef cows of the Shorthorn, Aberdeen Angus, and Hereford breeds. In the winter the herd is housed in one large barn, recently constructed for that purpose. The barn is well-lighted and ventilated at all times so that the cattle do not stand in foul air or in darkened corners. The herd bulls are fed a grain ration consisting of ground corn, oats, and bran in equal amounts, with some alfalfa hay or clover hay. They are not fed any silage. They have free access from their stalls to open lots and blue grass paddocks in summer, where there is plenty of clean, fresh water at all times.

The mature cows are fed a ration of ground corn, oats and bran of equal parts, with some alfalfa, clover, and silage. During the day time the cows are given the run of cinder lots except in cold, wet, rainy weather. During the winter months, when the weather is not too cold, the cows are left outside the barn over night.

The cows are bred as they come in heat, except in special cases where it is desired to have a calf dropped to fit for a particular showing class. Some inbreeding is practiced in this herd with good results. Just before calving, the cows are placed in a large, roomy box stall and kept well bedded. The feed is not changed until after calving, when the cow is given a pail of warm water and a few feeds of bran mash. The navel of the calf is disinfected immediately with iodine. The cow and calf are kept in the stall together for a few days, when the cow is given her place back in the line of tie-stalls. The young calves are then allowed to suckle their dams night and morning, and are usually given a nurse cow in addition. As soon as the young calves are old enough to eat, they are given all they will clean up of a ration of ground corn, oats, and bran in equal parts, and one-tenth part oil meal, with a little cut alfalfa. None of the young calves are fed any silage. In the summer the cows



and calves are turned out on blue grass pasture or mixed pasture and given a limited amount of grain night and morning. The calves have access to a creep, where they are fed a mixed grain ration and one-tenth part of oil meal.

After weaning, the calves are allowed the run of blue grass or mixed pasture and are all fed their grain together in a large stall. The cattle that are being fitted for show are given special care in the way of feed and nurse cows. They are kept in a cool, shady portion of the barn during the day time, away from the heat and flies, and covered with blankets. They are turned out at night on blue grass pasture. They are fed three times daily on a ration of equal parts of corn, oats, and bran with one-tenth part of oil meal, and in case they do not fatten as fast as they should, more oil meal is added and about 2% of black strap molasses. As show time approaches, the cattle are washed occasionally, the rough hair trimmed off, and the feet trimmed and horns shined. In so far as possible, the cattle are cared for by one man only, as a change or irregularity in the personal care may throw them off feed. In order to obtain the highest degree of success in fitting cattle for show, the feeder must be most intimately acquainted with his cattle. He must know their habits, their likes and dislikes, know when to increase or decrease their feed for only "the eye of the master maketh his cattle fat and the righteous man is merciful to his beast."





## PROJECT 225

Summer 1913 - 168 Days

TABLE I.

Lot No.	Acres	Extra Feed	Initial Weight (calf in)	Final Weight (calf in)	Total Gain	Daily Cost	Season Cost	Total Acres Per Cow not Counting C. S. M.
1	8.15 clover	6 cows & 1 calf 4,211# alfalfa	5140	6285	1145	11.4¢	\$19.20	1.446
1 A	7.68 blue grass	6 cows & 1 calf 5,277# alfalfa	5175	5865	690	11.8¢	\$19.84	1.39
2	8.108 blue grass	10 cows & 2 calves Ave. daily ration 12.38# silage 0.3113# C. S. M.	8645	9190	545	7.57¢	\$12.72	.8974
3	11.54 blue grass	10 head 3652# alfalfa	Ave. 611	Ave. 730	Ave. 119	8.6¢	\$14.46	1.2
4	Dry Lot	10 head Daily ration 29.41# silage .75# C. S. M.	622	740.5	118½	6.6¢	\$11.02	.208

Note - Lots 1, 1A, and 2, 2 years old  
 Lots 3 and 4, 1 year old

Silage - 12 tons per acre.	Alfalfa C. S. M.	\$16.00	Pasture	\$10.00
		\$30.00	Silage	\$ 3.68
	Alfalfa - 4 tons per acre.			



TABLE II

## PROJECT 225

Summer 1914. May 16 - October 31 - 168 Days

Lot No.	Acres	Extra Feed	No. Calves	Ave. Init. Weight	Ave. Final Weight	Gain	Daily Cost	Season Cost	Days Pasture Per Acre
1	14.8 blue grass	8050# alfalfa 1610# straw	6	787.5	930.5	143	12.83¢	\$21.56	88.78
2	8.124 blue grass	0.413# C. S. M. 16.55# silage	5	890.5	861	-29.5	8.47¢	\$13.08	190.17
3	11.54 blue grass	4258# green corn 1495# stover	-	767	945	178	7.64¢	\$12.84	145.62
4	Dry Lot	0.823# C. S. M. 32.94# silage	-	872.5	1047	174.5	6.4¢	\$10.76	

Note - Lots 1 and 2, 3 years old  
 Lots 3 and 4, 2 years old

Alfalfa	\$16.00
Silage	3.14
C. S. M.	30.00
Green sto.	3.75
Dry stover	7.00





## PROJECT 225

Summer 1915. May 15 - November 6 - 175 Days.

TABLE III

Lot No.	Acres	Ave. Daily Ration	No. Cows	No. Calves	Initial Wt. of Cow	Final Wt. of Cow	Gain per Head	Average Daily Cost	Season Cost
1	15	Pasture alone-blue grass	10	5		1098	201	8.6¢	\$15.00
2	10	0.256# C.S.M. 10.257# silage blue grass	10	5		1073	103	8 ¢	14.03
3	5	0.774# C.S.M. 30.971# silage blue grass	10	5		1067	106	9.8¢	17.196
4	Dry Lot	1# C.S.M. 40# silage	5	4		1042	56	9 ¢	15.75
4a	Dry Lot	1# S.B.M. 40# silage	5	4		1072	104	9 ¢	15.75

The final weights of calves when they were weaned, October 2, 1915, were as follows:

Final Weight		Extra Feed Cost <sup>1</sup>	
Lot 1	448		\$6.06
" 2	520		9.09
" 3	520		9.59
" 4	487 $\frac{1}{2}$		9.25
" 4a	431 $\frac{1}{4}$		8.17

Silage	\$ 3.75
Corn	.60
Alfalfa	16.00
Soja beans	30.00

Extra feed consisted of corn and L.S.O.M. and was fed to calves in a creep while they were running with their dams before weaning.



TABLE IV

PROJECT 225

Summer 1916. May 20 - October 14 - 147 Days.

Lot No.	Area	Extra Feed	No. Cattle	Area Per Cow	Ave. Init. Wt. of Cows	Final Wt.	Gain Per Head	Daily Cost Per Head	Season Cost Per Head	Days Pasture Per Acre
1	Approximately 7 acres sweet clover	Total feed 535# alfalfa hay	7 cows 7 calves	1 A	879 2/7	885 4/7	4 2/7	9.35¢	\$13.75	147
2 <sup>2</sup>	9 acres mixed pasture	Ave. daily feed .44# C.S.M. 17 1/2# silage (28 days)	9 cows 9 calves	1 A	858 1/3	1021 1/9	162 7/9	11.5 ¢		98
3	15 acres mixed pasture	Ave. daily feed 3/4# C.S.M. 30# silage (14 days)	10 cows 10 calves	1 1/2 A	895.5	978	82.5	10.98¢	\$16.11	98
4	Dry lot	1# C.S.M. 40# silage (147 days)	5 cows 5 calves		1043	910	-133	10.58¢	\$15.55	
4A	2 1/2 acres mixed	.73# C.S.M. 29.2# silage (147 days)	5 cows 5 calves	1/2 A	848	911	463	10.04	\$14.75	
X <sup>4</sup>	B.105 acres sweet clover	2 x 105 7 x 119 (days sweet clover)	9	8/9 A		935 1/2	75.5	7.76¢	\$ 9.01	128

Silage \$ 4.54  
 Alfalfa 14.00  
 All pasture 10.00  
 C.S.M. 30.00

1 Days pasture per acre figured as follows:

No. of cows x no. of days on pasture = days pasture per acre

No. of acres

4 Lot X consisted of two-yr.-old pure-bred heifers in high condition.

2 Lot 2 - 98 days

3 We let this sweet clover get too big before we turned in on it. Mowed half and killed it out.



## PROJECT 225

TABLE V Summer 1917. May 26 - November 3, 1917 - 168 Days.

Lot No.	Acres	Supplementary Feed	No. of Cattle	Area Per Cow Acres	Ave. Initial Wt.	Ave. Final Wt.	Gain Per Head	Daily Cost	Season Cost	Days Pasture Without C.S.M.
1 <sup>2</sup>	8.05 sweet clo- ver	C.S.M. 562# Sil. 22480#	8 cows 8 calves	1	1047.5	939 3/8	-108½	.1712	\$16.88	87.3
2	2.5 mixed pasture	C.S.M. 543.75 Sil. 21750	5 cows 4 calves	.5	1000	922	-78	.0926	\$15.548	246.6
3	9 mixed pasture	C.S.M. 372.375 Sil. 14895	9 cows 9 calves	1	936 2/3	1001 2/3	+65	.0834	\$14.013	157.6
4	15 mixed. pasture	C.S.M. 52.5 Sil. 2100	10 cows 10 calves	1.5	1094.5	1055.5	-49	.0625	\$10.509	111.3

## Price of feeds:

C.S.M.	\$34.00
Corn silage	\$ 4.00
Pasture	\$10.00

1. On pasture from May 19 to Sept. 1. Pasture became so short that cattle had to be removed at end of 98 days.

2. Days pasture figured as follows:

The herd bull was alternated between the four lots one-half the summer, through the breeding season, making 1/8 of the pasture season on each lot.

No. cows x no. days

No. acres pasture + area required to produce silage = No. pasture days





WINTER 1912-1913. DECEMBER 14 - MAY 17. 154 DAYS

TABLE VI.

Lot No.	Average Daily Rations	No. of Calves	Initial Wt. of Cows	Final Weight	Gain Per Head	Daily Feed Cost	Season Cost
1 2 yrs. old spring of '13	15½# alfalfa 8.83# stover 1.05# shelled corn 0.21# C.S.M.	1	720	846	126	15¢	\$23.12
2 Same age as Lot 1	30.57# silage 0.764# C.S.M.	2	716	830.4	114.4	7.1¢	\$10.85
3 Calves	10.46# alfalfa 5.7# stover 0.63# shelled corn 0.127# C.S.M.		480	596	116	9.9¢	\$15.37
4 Calves, i.e. yearlings - spring '13	25# silage 0.625# C.S.M.		475#	624#	149#	5.5¢	\$8.52

Price of feeds: Corn 46.5¢  
 Alfalfa \$16.00  
 Silage \$ 3.68  
 Stover \$ 3.00

Purchased the heifers in Lots 1 and 2 in central Missouri. Calves in Lots 3 and 4 were purchased on Kansas City market. All arrived at Experiment Station about two weeks before the test started. Heifers in Lots 1 and 2 were not supposed to be in calf, but 3 of them were.

Footnote 2 cont. from preceding page.

The herd bull was alternated between the four lots, one-half the summer, thru the breeding season, making 1/8 of the pasture season on each lot.



## PROJECT 225

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TABLE VII. WINTER - 1913 - 1914. NOVEMBER 1 - MAY 16. 196 DAYS

Lot No.	Ave. Daily Rations	No. of Calves	Initial Wt. of Cows	Final wt. of Cows	Gain per Head	Daily Cost Per Head	Season Cost Per Head
1 3 in spring	2.77# D.D.C. 8# alfalfa 3.26# stover mixed hay	6	942.5	787.5	-155	9.59¢	\$18.79
2 3 in spring	17.22# silage 8# alfalfa	5	854	890	36	9.1¢	\$17.83
3 2 in spring	20# silage 1# C.S.M. 5.34# straw		730	767	37	5.03¢	\$9.26
4 2 in spring	30# silage 3/4# C.S.M.		740.5	872.5	132	5.83¢	\$11.43

Silage \$3.14  
 Straw \$4.00  
 C.S.M. \$20.00  
 Stover \$3.00





## PROJECT 225

WINTER 1914-1915 - OCTOBER 31-May 15. 196 DAYS

TABLE 8.

Lot No.	Ave. Daily Ration	No. Cow Calves	No. Bull Calves	Total	Ave. Birth Wt.	Ave. Init. Wt. of Cows	Ave. Final Wt. of Cows	Gain	Da. Cost Per Head	Season Cost Per Head
1 4 yrs. in spring	2.564# B.F.C. 7.546# alfalfa 12# straw	4	1	5	69.4	930.5	897	-33.5	10.6¢	\$20.77
2 4 yrs. in spring	30 $\frac{1}{2}$ # silage .769# C.S.M. 5# straw	4	1	5	69.9	985	970	-15	7.9¢	\$15.52
3 3 yrs. in spring	7.596# B.F.C. 1.13# C.S.M. 7.5# stover	1	4	5	73.9	945	898.5	-46.5	9.3¢	\$18.27
4 3 yrs. in spring	26 $\frac{1}{2}$ # silage 0.917# C.S.M.	5	3	8	77.76	1047	977	-70	8.2¢	\$16.11
Average birth wt. of calves				76.22#	71.65#					

Feed Prices:      Corn      60¢  
                          Silage      \$3.75  
                          Straw      \$4.00  
                          Stover      \$3.00  
                          C. S. M.      \$30.00

Unsatisfactory percentage of calves, due to fact that cattle were badly scattered during breeding season, and it was difficult to get bull around often enough. During the summer of '14, when this crop of calves was sired, these pastures were so scattered that our feed wagon travelled between 14 and 16 miles a day in making the rounds to all the cattle twice, and we attempted to breed most of these cows to one bull.



TABLE IX.

Lot No.	Ave. Daily Ration	No. Cow Calves	No. Bull Calves	Total	Ave. Birth Weight	Ave. Init. Wt. for Cows	Ave. Final Wt. of Cows	Gain per Head	Da. Cost	Season. Cost
1	1# C.S.M. 10# silage 18.14# straw (10 cows)	5	5	10	75	1098	875½	-222½	7.44	\$14.50
2.	1# C.S.M. 20# silage 12.16# straw (10 cows)	3	6	9	70	1075	886.5	-188½	8.54	\$16.66
3	1# C.S.M. 30# silage 6.07# straw (10 cows)	7	3	10	71.8	1065	895.5	-169.5	9.54	\$18.62
4	1# C.S.M. 40# silage (5 cows)	4	1	5 <sup>1</sup>	76.5	1042	1043	1	10.6	\$20.77
4a	5# alfalfa 15.76# straw (5 cows)	2	1	3	70	1072	936	-136	6.7	\$13.13
Average birth wt. of calves,		68	79.7	37						

Price of Feeds:

Alfalfa	\$14.00
Silage	\$ 4.54
Corn	.65

1. Calved June 19



TABLE X

Winter 1916 - 1917.

PROJECT 225

November 18 - May 26

- 189 days.

Lot	Average Daily Ration	No. Cows	Calves		Average Birth Weight	Average Initial Weight	Average Final Weight	Gain	Daily Cost	Season Cost
			cc	bc						
I <sup>1</sup>	Silage 20# C.S.M. 1# Oat straw 13.97#	5	3	1	72.75	1088	1035	-53	<del>.0824</del>	\$15.095
II	Silage 20# C.S.M. 1# Oat straw 15.18# (cut)	5	3	2	71.8	1074	1048	-27	<del>.0854</del>	15.535
III	Green stover silage <sup>2</sup> 68.21# C.S.M. 1# Corn meal silage 40# Alfalfa 3#	10	2	6	79.87	1015	921.5	-93.5	.0979	18.39
IV	Silage 20# Alfalfa 5# Oat Straw 8.49#	10	5	4	74.55	1215	1121	-94	.0969	18.32

1. 182 days in test.

2. Green stover silage and cottonseed meal fed but 39 days.

Feed prices:

Normal silage	\$4.00 per ton
Green stover sil.	" "
Cottonseed meal	30.00 " "
Alfalfa hay	16.00 " "
Oat straw	4.00 " "





## PROJECT 225

Winter 1917-18. January 26 - May 4. 98 Days

TABLE XI.

Lot	Silo <sup>1</sup> No.	Ave. Daily Ration	Ave. Init. Wt.	Ave. Final Wt.	Ave. Gain	No. Calves		Birth Wt.	Per Ort. Calf Crop	Daily Cost	Season Cost
						cc	bc				
1	2	Silage 71.827#	1029	976.5	-52.5	9 <sup>2</sup>	1	61.6	100	.08384	\$8.219
2	4 84 days	Silage 60.86# Oil Meal 1#	1022	998.5	-23.5	4	4	74.63	80	.0758	6.369
2	2 14 days	Silage 75.128# Oil meal 1#	---	---	---	-	-	---	---	.0862	1.208
3	5 76.5 days	Silage 55.8# Oil meal 1#	1049	1045 <sup>3</sup>	-4	3	1	73	40	.0646	4.435
3	7 21.5 days	Silage 65.565# Oil meal	---	---	---	-	-	---	---	.0791	1.702
4	6 42 days	Silage 56.797# Oil meal 1#	1029	961.5	-56.5	5	4	76	90	.0711	2.789
4	7 56 days	Silage 58.739# Oil meal 1#	----	----	----	-	-	---	---	.0740	4.148
5	8	Silage 40# Oil meal 1#	1028	945	-83	4	3	76.42	70	.2077	20.364

1. Silo No. 2 green stover silage

Silo No. 4 water 6 parts, dry stover 12 parts

" " 5 " 10 " " " "

" " 6 " 12 " " " "

" " 7 " 12 " " " "

+  $\frac{1}{2}$  of 1% Blackstrap molasses

2. One cow dropped twin cow calves of 22 lbs. wt. each, one of which was dead, and the other died soon after.

Another cow dropped a dead cow calf of 35# weight.

3. Does not include one cow removed March 24.

Stover silage	\$1.5 per ton
Normal "	9.40 "
Oil meal	60.00 "



PROJECT 225.

TABLE XII\*

Summer Season.	Days	Average Daily Ration	No. in Lot	Initial Weight	Final Weight	Gain Per Head	Daily Cost	Season. Cost	Acres required per cow.
I918	I68	Silage 29.41# C. S. M. .75#	10	622	740.5	118.5	6.6¢	\$11.02	.1743
I914	I68	Silage 32.94# C. S. M. .824#	10	872.5	1047	174.5	6.4¢	\$10.76	.2305
I915	I75	Silage 40# C. S. M. 1#	5 4	936	1042	56	9¢	\$15.75	.2915
	I75	Silage 40# S. B. M. 1#	5 4	968	1072	104	9¢	\$15.75	.2915
I916	I47	Silage 40# C. S. M. 1#	5 5	1043	910	133	7.78¢	\$9.01	.2450

\* This table is an extract from Tables I and IV inclusive, showing results, in lot IV, of substituting silage for pasture.





TABLE XIII

SUMMARY OF DATA ON LONG-CONTINUED USE OF CORN SILAGE AND COTTONSEED MEAL

Season	Days	Average Daily Ration	No. in Lot	Init. Wt.	Final Wt.	Gain Per Head	No. Calves		Ave. Birth Wt.	Daily Cost	Season Cost
							cc	bc			
Winter '12', '13	154	Silage 25# C. S. M. .625#	12	475	624	149	-	-	-	5.5¢	\$ 8.52
Summer '13	168	Silage 29.41# C. S. M. .75#	10	622	740.5	118.5	-	-	-	6.6¢	11.02
Winter '13, '14	196	Silage 30# C. S. M. 1.75#	10	740.5	872.5	132	-	-	-	5.83¢	11.43
Summer '14	168	Silage 32.94# C. S. M. .823#	10	872.5	1047	174.5	-	-	-	6.4¢	10.76
Winter '14, '15	196	Silage 36.5# C. S. M. .917#	10	1047	977	-70	5	3	77.75	8.2	16.11
Summer '15	175	Silage 40# C. S. M. 1#	5 4	986	1042	56	-	-	-	9	15.75
	175	Silage 40# S. B. M. 1#	5 4	968	1072	104	-	-	-	9	15.75
Winter '15, '16	196	Silage 40# C. S. M. 1#	5	1042	1043	1	4	1	76.5	10.6	20.77
	196	Alfalfa 5# Straw 15.76#	5	1072	936	-136	2	1	70	6.7	13.13
Summer '16	147	Silage 40# C. S. M. 1#	5 5	1043	910	-133	-	-	-	7.76	9.01



TABLE XIV.

WINTER OF 1904 - 1905.

140 DAYS.

Lot	Average Init. Weight	Average Final Weight	Season Gain	Season Cost	Feed Consumed Daily					
					Silage	Clover Hay	Oat Straw	Stock Corn	Corn Stover	Shredded Stover
1	860.33	1010.43	150.1	\$13.535	16.65	3.5	9.56			
2	858.5	964.69	106.19	6.501		3.5	10.83	8.7		
3	859.83	916.36	56.53	5.172		1.56	8.19		11.67 <sup>1</sup>	10.29 <sup>2</sup>

1. Corn stover first 42 days
2. Shredded stover last 98 days.

## Prices of Feeds:

Corn silage.....\$3.34 per ton  
 Shock corn ..... 5.59 " "  
 Corn stover..... 2.25 " "  
 Shredded stover..... 2.25 " "  
 Clover hay..... 8.00 " "  
 Oat straw..... 1.50 " "



TABLE XV

WINTER OF 1915-1916

Lot	Average Initial Weight	Average Final Weight	Total Gain	Feeds Consumed Daily			
				Silage	Mixed Hay	Shock Corn	Wheat Straw
1	865	840	-25	20	8		2.76
2	870	916	46	25			8
3	867	878	11		10	15	2.1
							1.5

TABLE XVI.

Feeds	Ration 1	Ration 2	Ration 3	Ration 4
Silage	25 - 30#	25 - 30#	25 - 30#	25 - 30#
Legume hay Cowpea Soybean Alfalfa Clover	6 - 8#			
Non-legumes; Timothy Rye Stover		6 - 8#		
Straw Wheat Oats Rye	2 - 4#	2 - 4#	8 - 10#	
C.S.M. or L.S.O.m.		.5 - 1#	1 - 2#	1 - 2#





TABLE XVII. SUMMARY OF MAINTENANCE OF BEEF BREEDING COWS AVERAGE OF  
THREE WINTERS - DECEMBER 1, 1911 - NOVEMBER 25, 1914.

	Lot I	Lot II
	10 Shorthorns	10 Angus
Average length of winter	154.6	154.6
Initial weight per cow	1179.546	1142.899
Final weight per cow	1267.531	1198.186
Gain per cow	87.986	55.287
Total feed per lot	91010.41	89201.91
C.S.M.	1546.66	1546.66
Average daily feed per cow		
Corn silage	58.83	57.63
Cottonseed meal	1	1
Cost of feeds		
Corn silage      \$3.50	\$159.27	\$156.19
C.S.M.          \$30.00	\$23.22	\$23.22
Feed cost per cow	\$18.25	\$18.44
Bedding per cow		
1090# @ \$8	4.35	4.35
Labor for feeding	2.33	2.33
Value of manure per cow @ \$1.56		
net cost of wintering one cow	\$17.61	\$17.50



TABLE XVIII. ANNUAL COST OF MAINTENANCE PER BREEDING COW AT VARYING FEED PRICES

Lot I - Shorthorn (per cow)

Price of oil meal per ton	\$36.00	\$38.00	\$40.00	\$42.00	\$44.00	\$46.00
Amount of oil meal per cow 154.3#	2.78	2.93	3.08	3.24	3.39	3.55
Price of corn silage per ton	3.50	4.00	4.40	5.00	5.50	6.00
Corn silage per cow 9.864#	17.26	19.73	22.19	24.66	27.13	29.50
Other expenses per cow	19.34	19.34	19.34	19.34	19.34	19.34
Total annual expense per cow	\$39.38	\$42.00	\$44.61	\$47.24	\$49.86	\$52.48
Lot II - Aberdeen Angus (per cow)						
Price of cottonseed meal per ton	\$30.00	\$33.00	\$36.00	\$39.00	\$41.00	\$44.00
Cottonseed meal per cow 154.3#	2.31	2.55	2.78	3.01	3.24	3.47
Price of corn silage per ton	3.50	4.00	4.50	5.00	5.50	6.00
Corn silage per cow 10.108#	17.69	20.22	22.74	25.27	27.80	30.32
All other expenses per cow	19.81	19.81	19.81	19.81	19.81	19.81
Total annual expense per cow	\$39.81	\$42.58	\$45.33	\$48.09	\$50.85	\$53.60





TABLE XIX.

## SUMMARY OF SUMMERS 1912 - 1913 - 1914

	Lot I - Shorthorns	Lot II - Aberdeen Angus
Summer period (days)	210.3	210.3
Initial wt. per cow	1208.375	1174.895
Final wt. per cow	1258.521	1189.519
Gain per cow	50.146	14.725
Interest on cow pasture	56.00	56.00
Interest on calf pasture	6.31	13.16
Labor cost	8.03	8.03
Total cost per cow	7.034	7.710

## SUMMARY OF SUMMERS 1915-16 AND ANNUAL COST PER COW.

	Lot I - Shorthorns	Lot II - Aberdeen Angus
Ave. length of summer (da)	210	210
Ave. initial weight	1181.38	1139.09
Ave. final weight	1248.49	1212.40
Ave. gain in weight	67.11	73.31
Ave. weight of calves supported per cow	249.31	360.53
Interest on cow pasture	4.63	4.63
Interest on calf pasture	1.09	1.53
Labor cost per cow	.77	.77
Net cost per cow	6.49	6.93
Mortality risk per cow	1.33	1.33
Mortality risk per calf	2.02	2.02
Interest on value of cows	6.00	6.00
Service of sire	2.00	2.00
Depreciation and equipment	1.50	1.50
Cost of wintering per cow	22.97	23.23
Total annual cost per cow	42.31	43.04



TABLE XX. RATIONS FOR WINTERING BEEF BRINDING COWS. 15 MATURE HERFORD COWS TO LOT.

Lot No.	Initial Wt.	Final Wt.	Season Gain	Daily Gain	Season Cost	Daily Cost	No. Calves	Silage	Feed Consumed Daily				Cotton-seed cake
									Wheat Straw	Corn Fodder	Alfalfa		
5	1051	1052	1	.001	9.99	.10	12	13.7	26.9	17.9	--	1.9	
6	1049	1049	0	.0	13.27	.133	8	13.7	---	25.4	--	1.9	
7	1058	1065	7	.007	5.12	.051	6	13.7	25	17.1	--	--	
8	1050	1053	3	.003	16.15	.161	13	13.7	----	----	15.9	--	

Price of feeds:

Silage..... \$5.00  
 Wheat straw..... 1.00  
 Corn fodder..... 4.00  
 Alfalfa..... 16.00  
 Cottonseed cake..... 50.00

1. Wheat straw first 80 days
2. Corn stover last 20 days



TABLE XXI. RATIONS FOR WINTERING BEEF BREEDING COWS. DECEMBER 19, 1917 AND MARCH 28, 1918.

Lot	No. Cows	Initial Wt	Final Wt.	Season Gain	Daily Gain	Season Cost	Daily Cost	No. Calves	Feeds Consumed Daily				Cotton- seed cake
									Silage	Wheat Straw	Kafir Fodder	Alfalfa	
1	20	1074	1123	49	.49	\$24.07	.241	15	13.7	13.4	13.6	11.4	.96
16	19	969	1021	52	.52	23.60	.236	10	13.7	11.7	7	12.2	.96
2	20	998	992	-6	-.06	15.33	.153	15	13.7	13.4	12.3	11.9	--
15	20	871	902	31	.31	14.81	.148	15	13.7	11.9	2.8	13.2	--

Feed prices: Alfalfa \$16  
Wheat straw \$ 1  
Kafir fodder \$ 8  
Silage \$ 5  
Cottonseed cake \$50

1. First 40 days.







Lot X of table IV. Nine two-year-old purebred heifers on 8.05 acres of sweet clover. Summer of 1916. Picture taken Oct. 7, 1916.



Lot III of table IV. Nine cows and calves on 9 acres of mixed pasture. Summer of 1916. Picture taken Oct. 4, 1916.







Lot I of table V. Eight cows and calves on 8.05 acres of sweet clover. Summer of 1917. Picture taken a few weeks after cattle were turned on the pasture.



Lot III of table V. Nine cows and calves on 9 acres of mixed pasture. Summer of 1917. Picture taken soon after cattle were turned on pasture.







Lot II of table V. Five cows and four calves on 2.5 acres of mixed pasture. Summer of 1917. Picture taken soon after cattle were turned on pasture.



Lot IV of table V. Ten cows and calves on 15 acres of mixed pasture. Summer of 1917. Picture taken soon after cattle were turned on pasture.







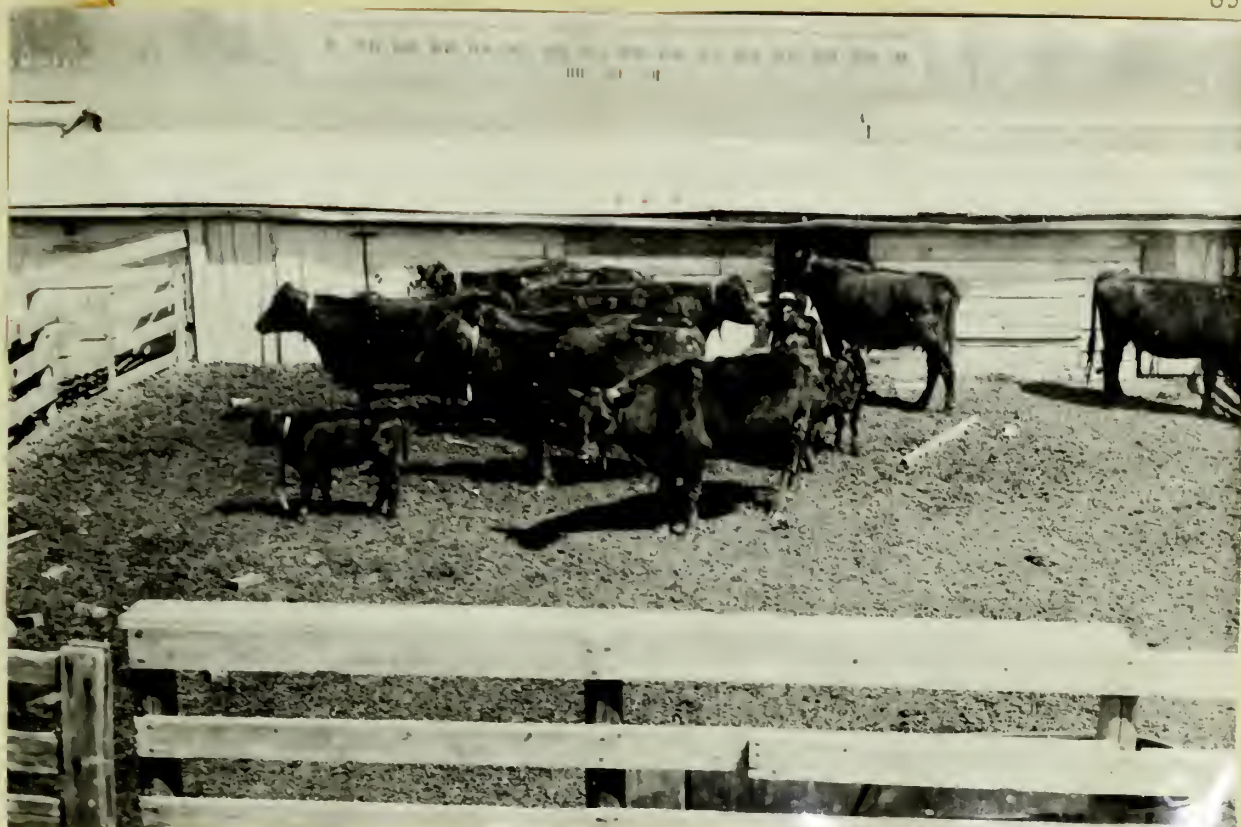
Lot I of table XI.



Lot II of table XI.







Lot III of table XI.



Lot IV of table XI.







Lot V of table XI.



Winter quarters of experimental cattle in project 229.







Lot IV of table XI. Cow with twins born six days apart.



Lot IV twin pictures taken at the age of nine days and three days. The larger one is the younger one.







Silo number 2. Green stover silage, 8 lbs. refused.



Silo number 4. Water and dry stover 8:12 20 lbs. silage refused.



Silo number 5. Water and dry stover 10:12 2 lbs. silage refused.







Silo number 6. Water and dry stover 12:12. 139 lbs. silage refused.



Silo number 7. Water and dry stover 12:12 plus onehalf per cent of blackstrap molasses. 139 lbs. silage refused.



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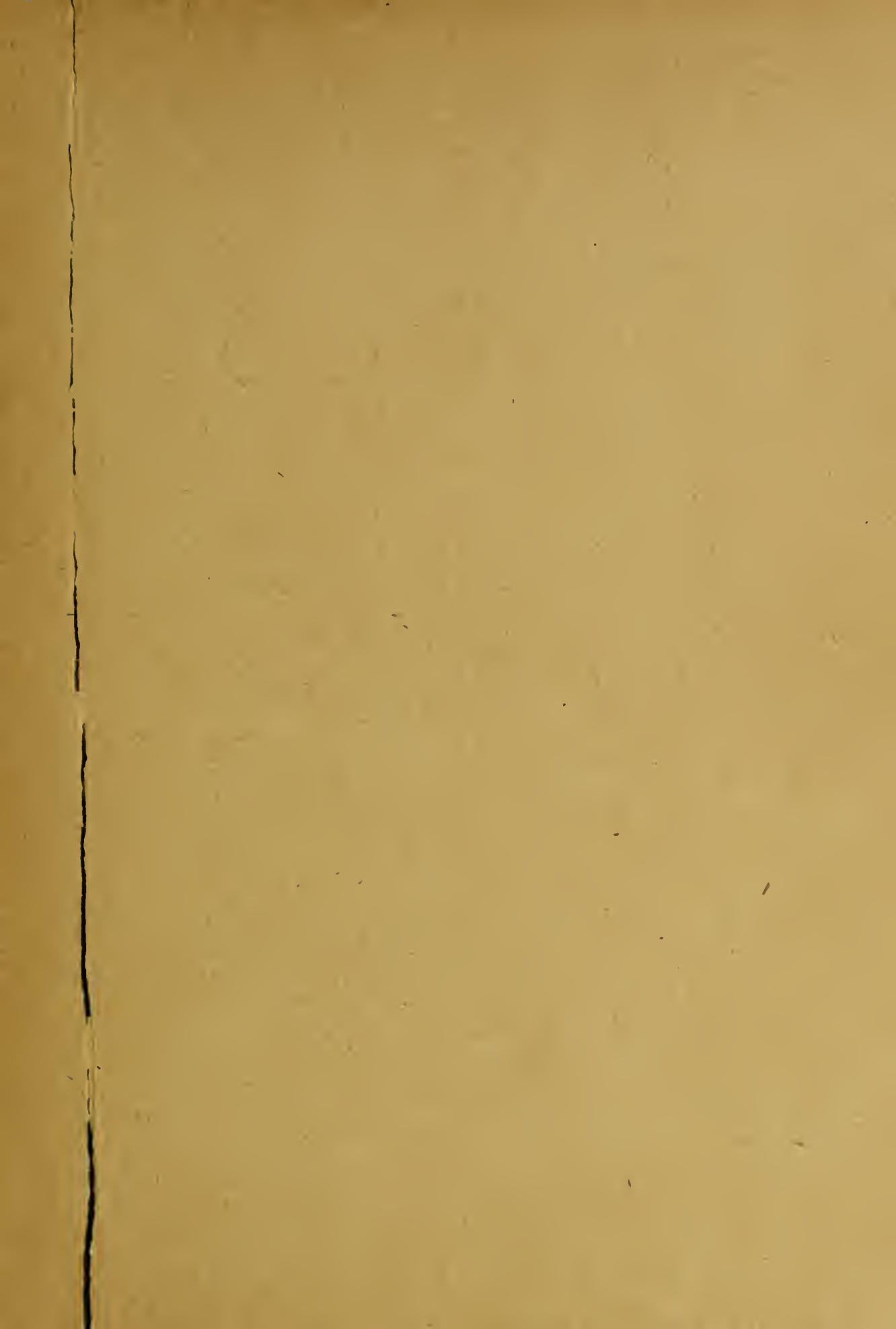




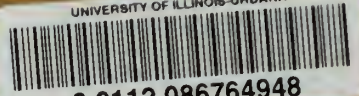
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